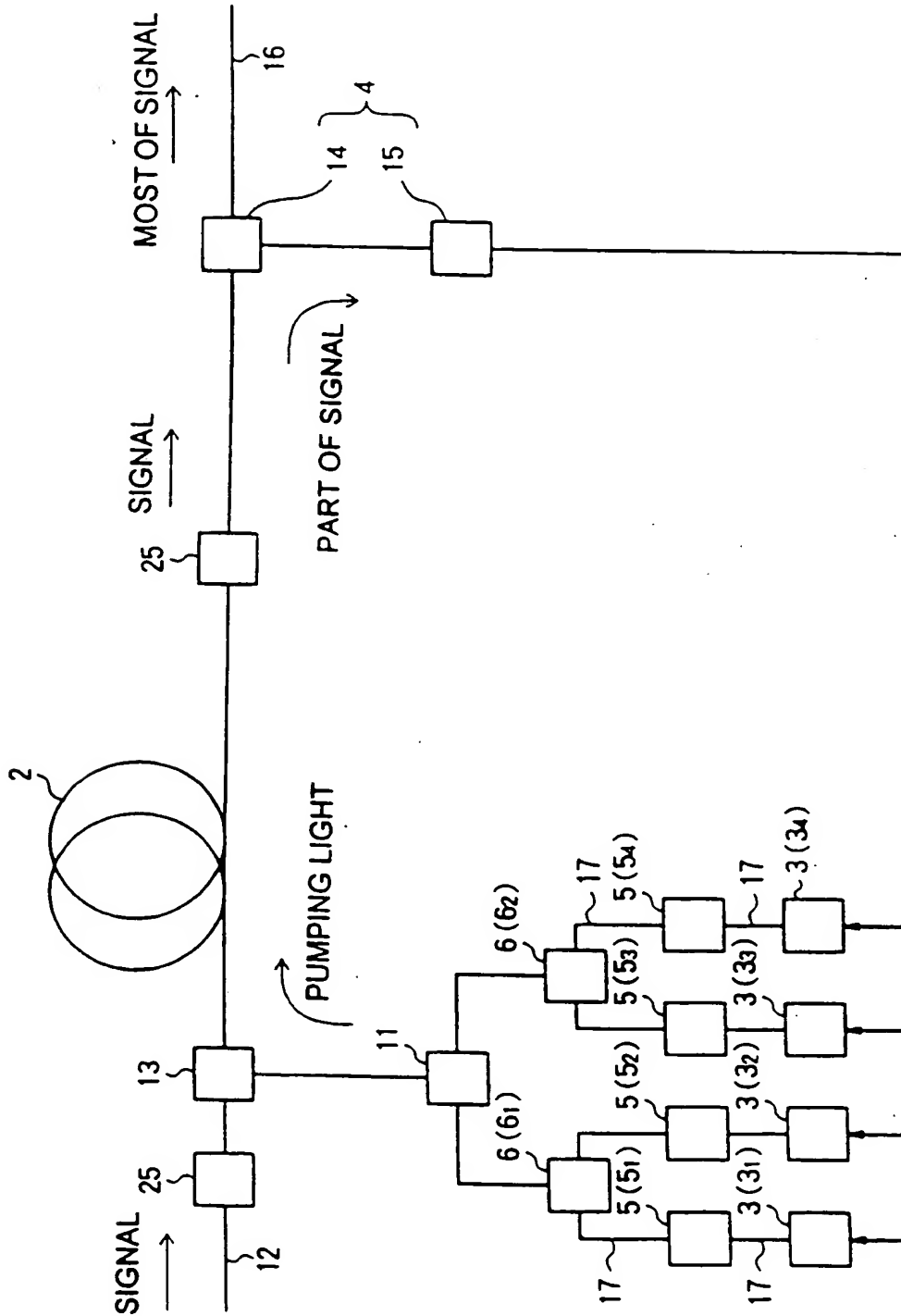


FIG. 1



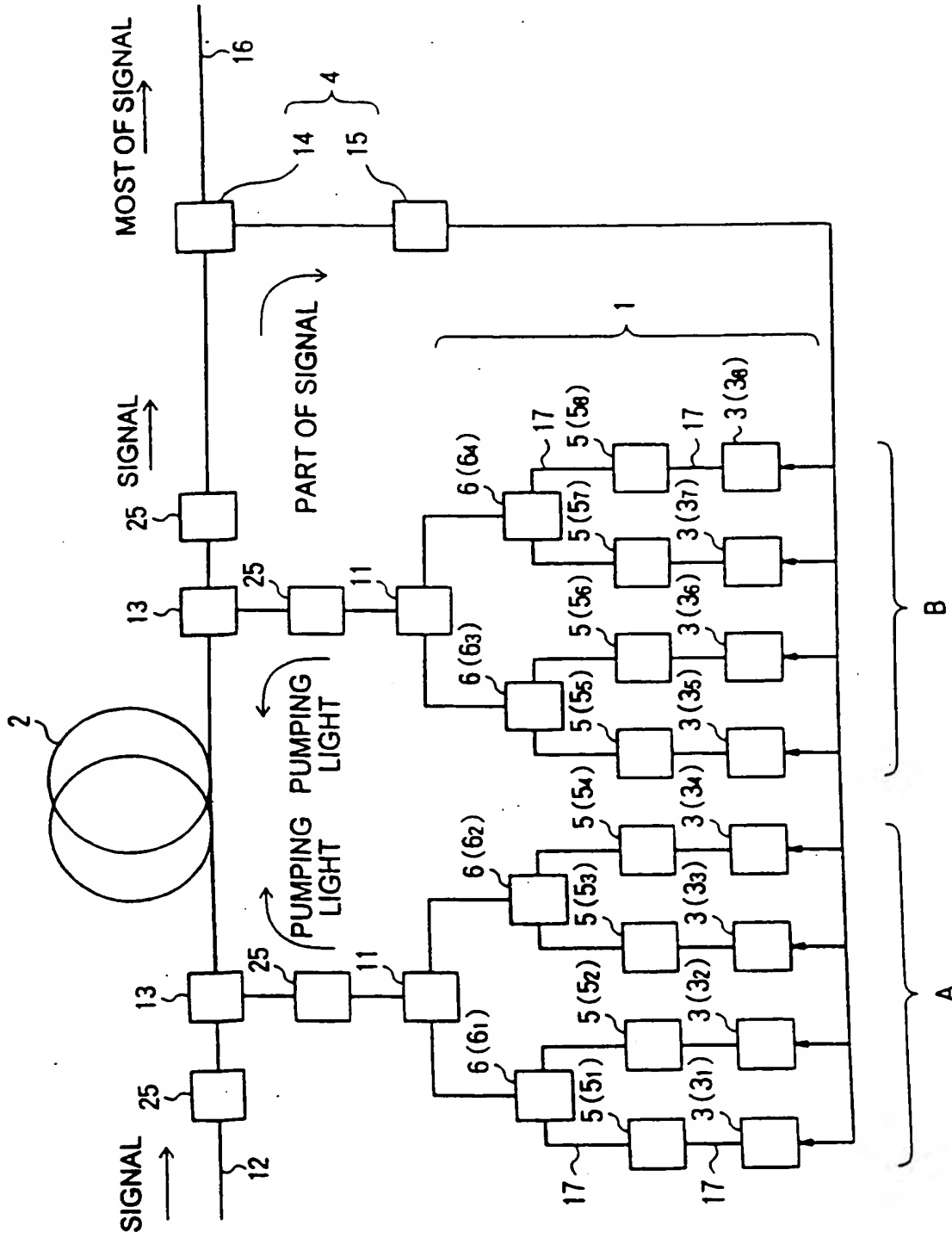


FIG. 3

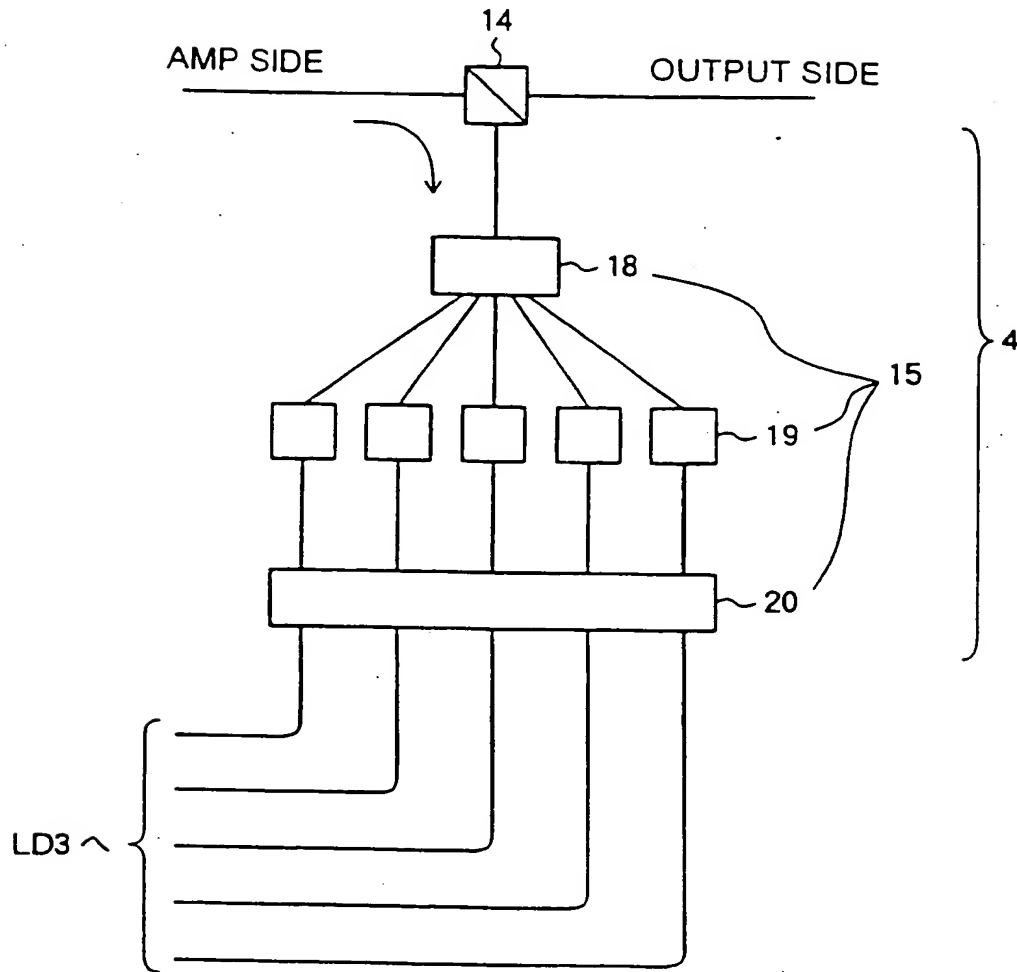


FIG. 4

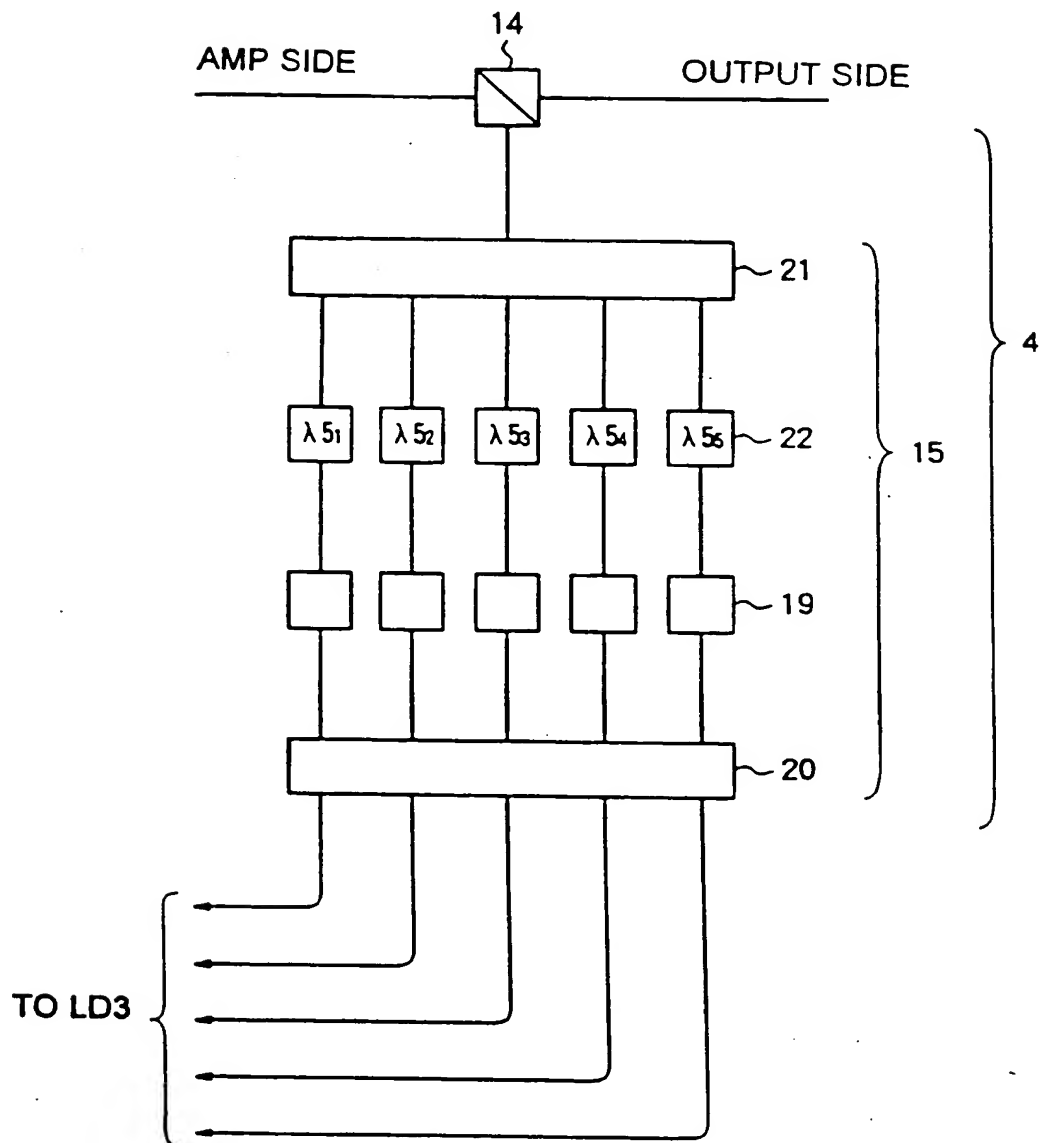


FIG. 5

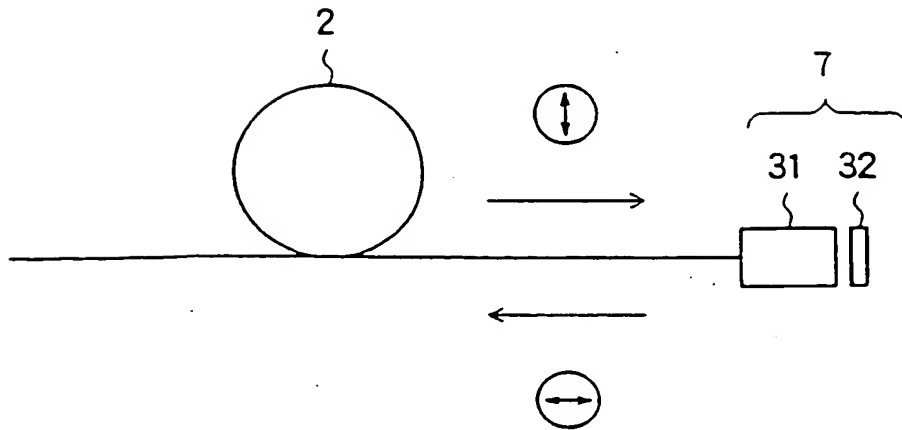


FIG. 6A

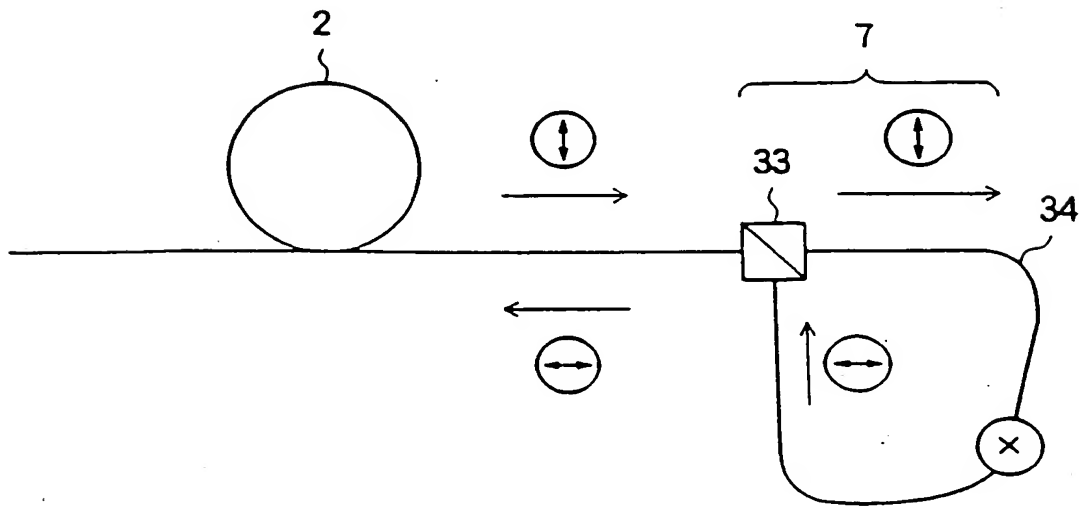


FIG. 6B

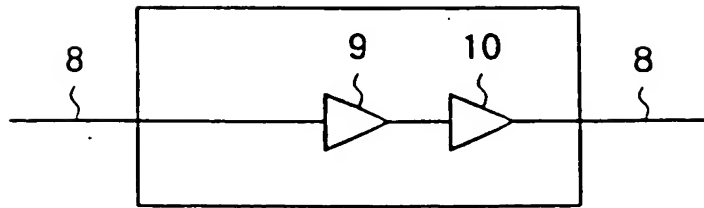


FIG. 7

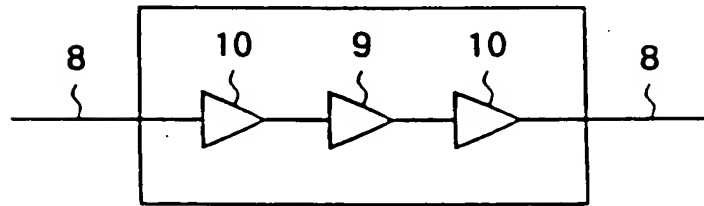


FIG. 8

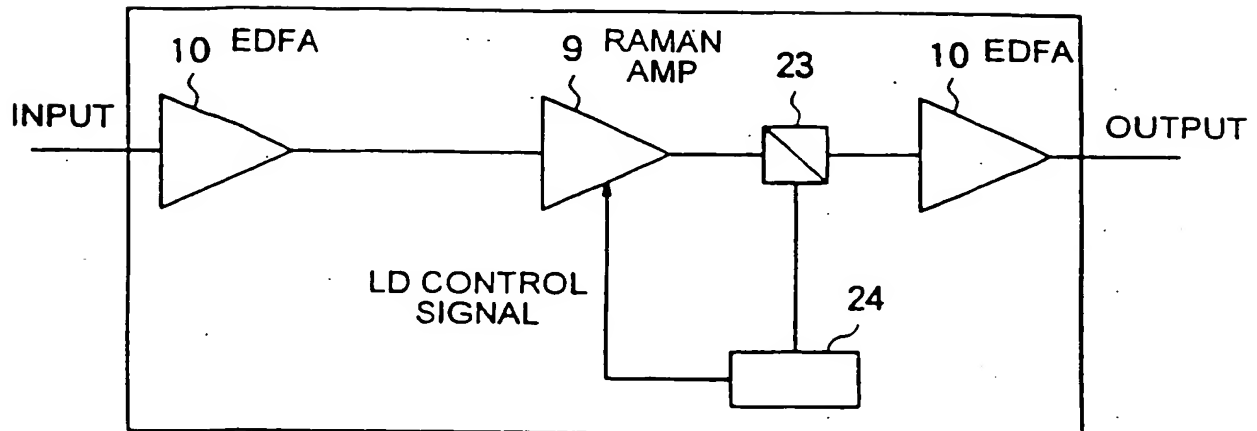


FIG. 9

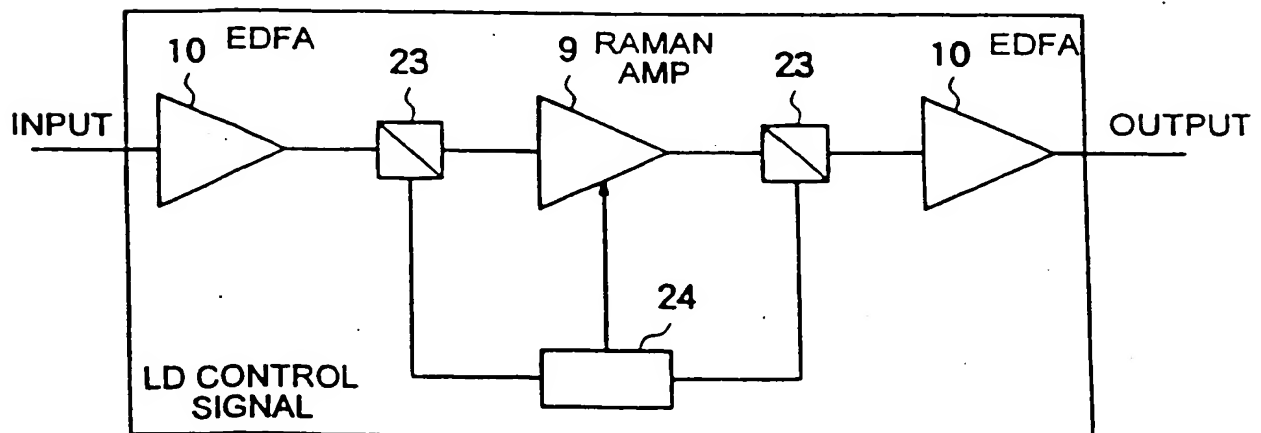


FIG. 10



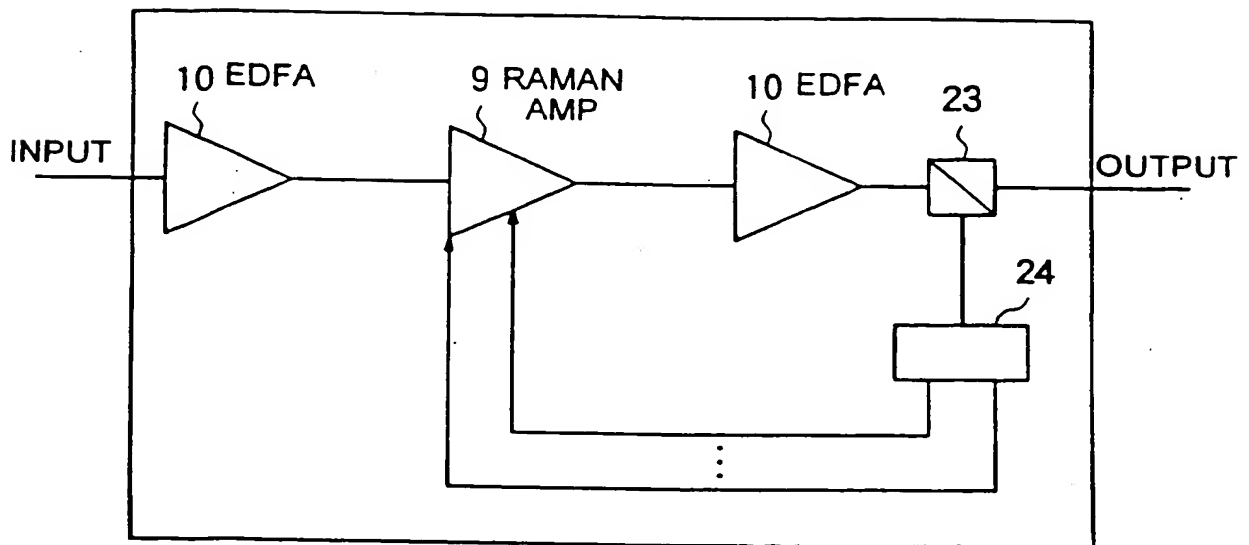


FIG. 11

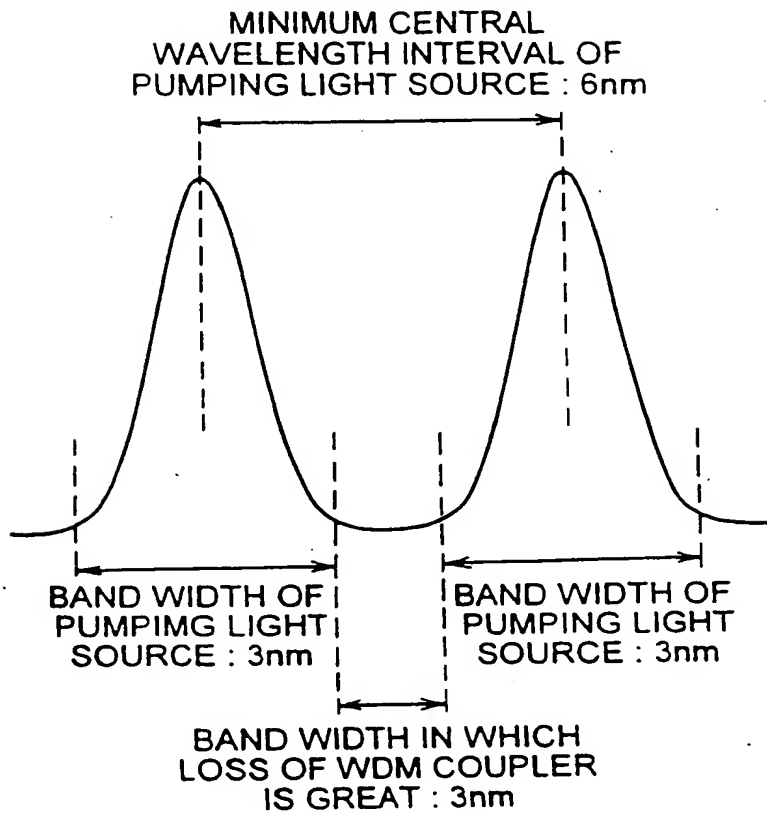


FIG. 12

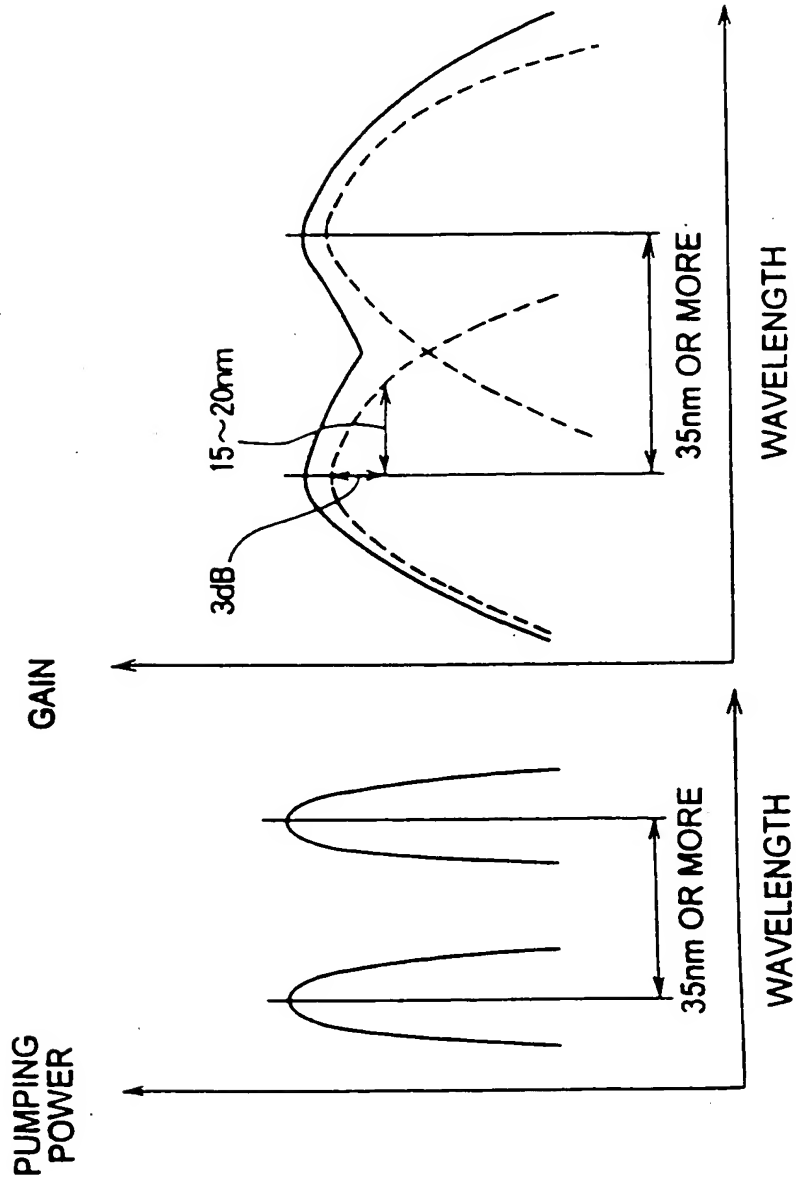
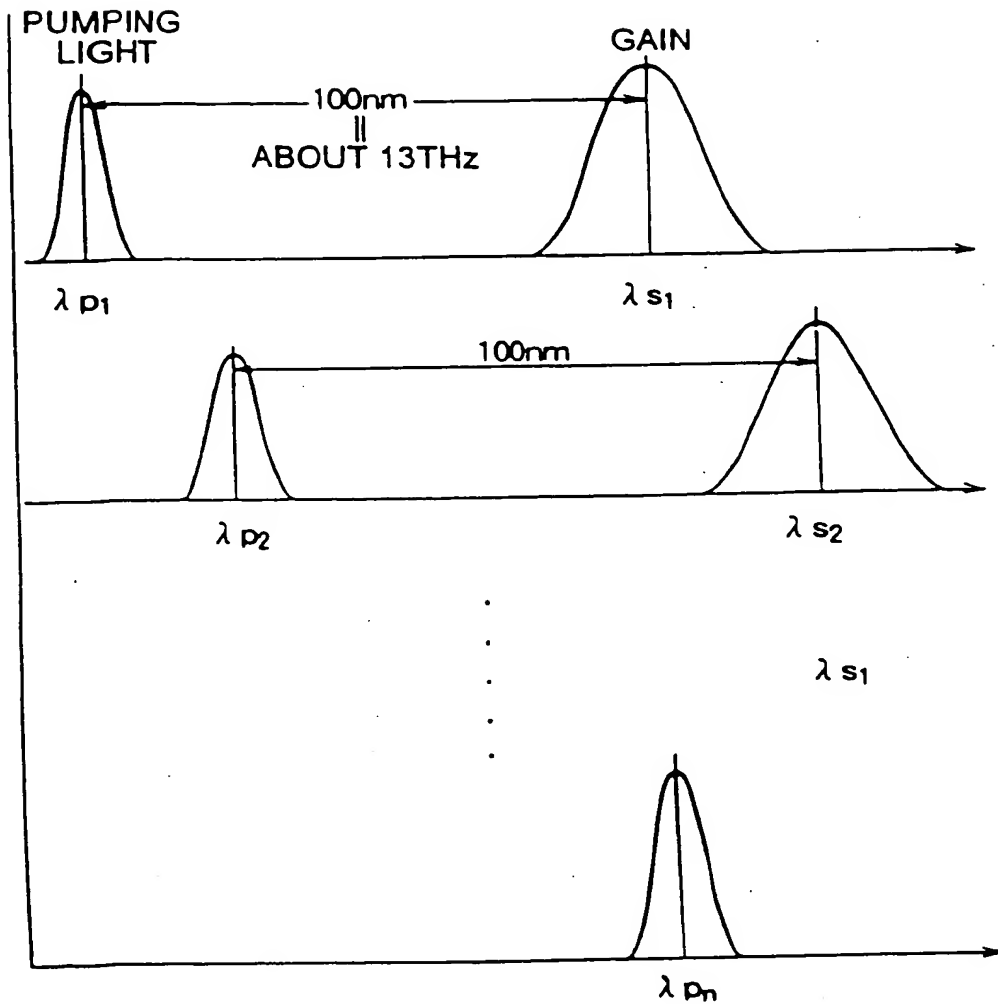


FIG. 13A

FIG. 13B



IN ORDER NOT TO OVERLAP  $\lambda pn < \lambda s1$



$$\lambda pn - \lambda p1 < 100nm$$

FIG. 14

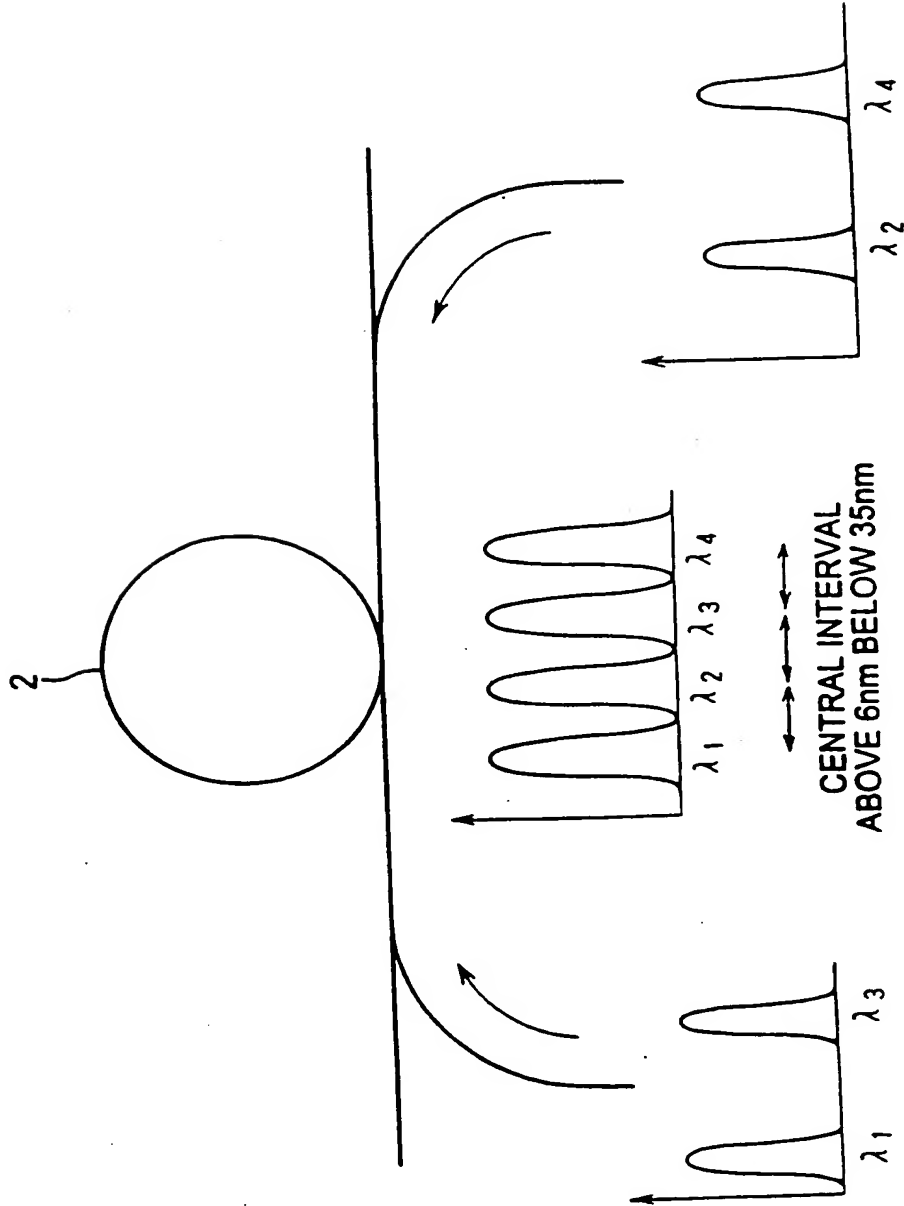
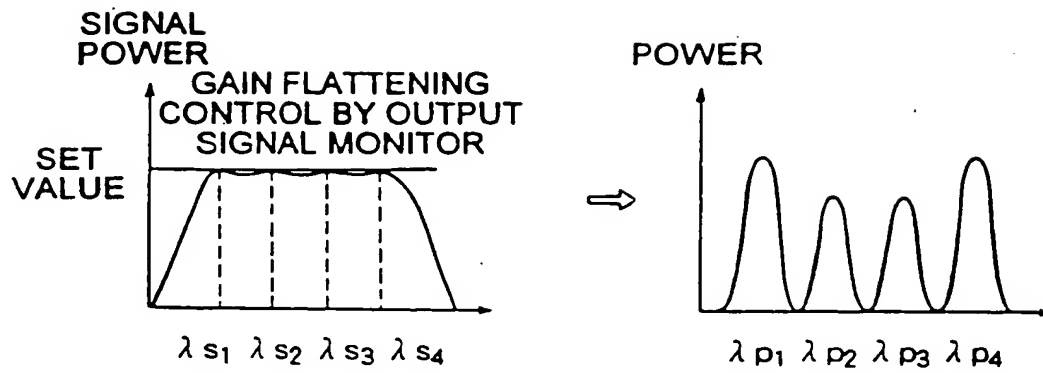


FIG. 15



$$\lambda_{s1} \approx \lambda_{p1} + 100\text{nm}$$

$$\lambda_{s2} \approx \lambda_{p2} + 100\text{nm}$$

$$\lambda_{s3} \approx \lambda_{p3} + 100\text{nm}$$

$$\lambda_{s4} \approx \lambda_{p4} + 100\text{nm}$$

FIG. 16

REPEATER SPECIFICATION	①	②	③
REPEATER INPUT $P_{in}$ [dBm/ch]	$-20 \pm 3$	$-15 \pm 2$	$-15 \pm 1$
REPEATER OUTPUT $P_{out}$ [dBm/ch]	10	10	5
DCF LOSS $L_d$ [dB]	$10 \pm 2$	$8 \pm 1.5$	$6 \pm 1$

FIG. 17A

EDFA DESIGN EXAMPLE	①	②	③
AMPLIFIER 1 GAIN $G_1$ [dB]	$20 \pm 3$	$15 \pm 2$	$15 \pm 1$
AMPLIFIER 2 GAIN $G_2$ [dB]	$20 \pm 2$	$18 \pm 1.5$	$11 \pm 1$
REPEATER GAIN $G_r$ [dB]	$30 \pm 3$	$25 \pm 2$	$20 \pm 1$

FIG. 17B

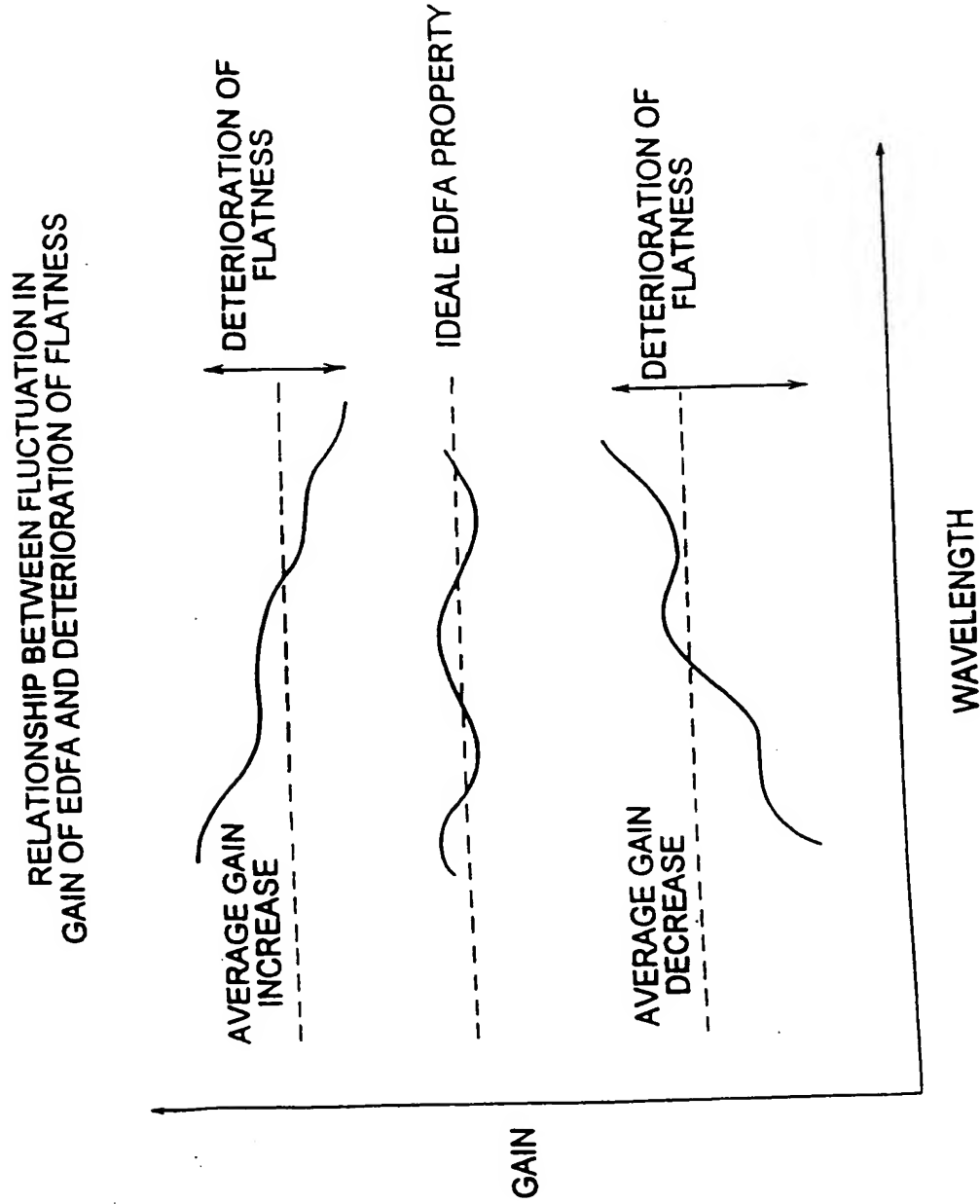


FIG. 18



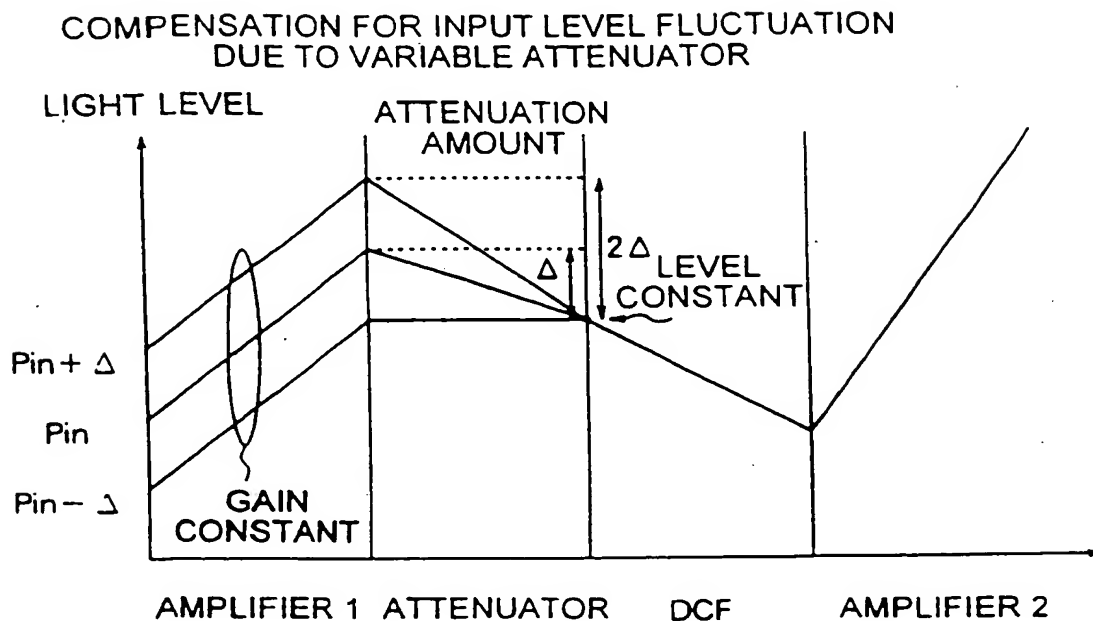


FIG. 19A

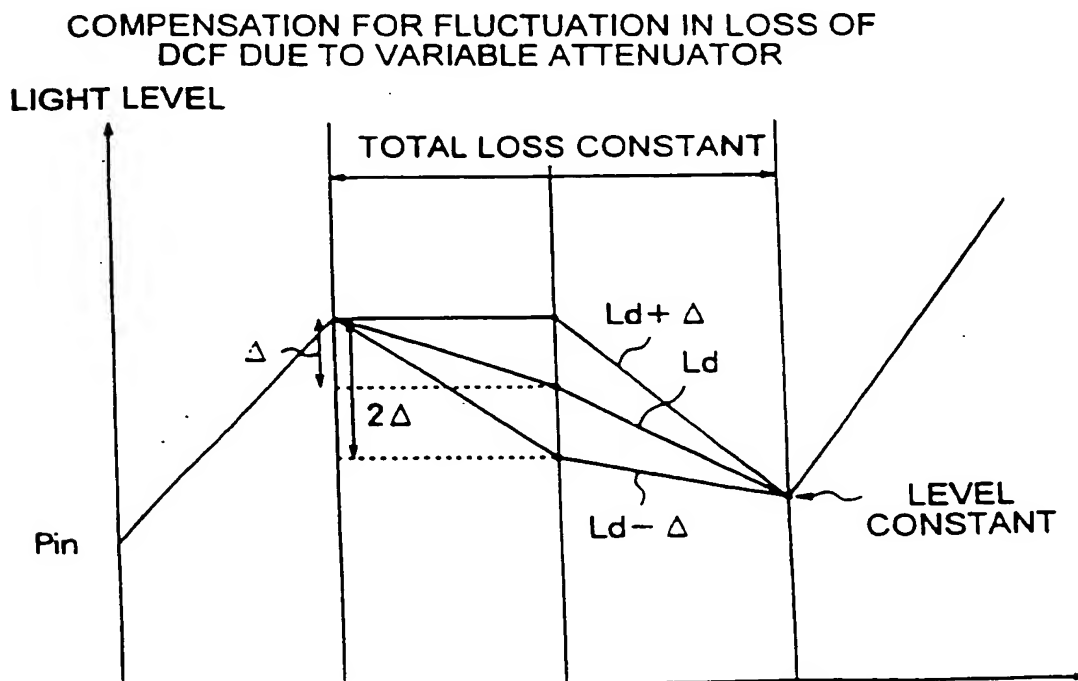


FIG. 19B

SPECIFICATION	①	②	③
REPEATER INPUT	$-20 \pm 3$	$-15 \pm 2$	$-15 \pm 1$
REPEATER OUTPUT	$+10$	$+10$	$+5$
DCF LOSS	$10 \pm 2$	$8 \pm 1.5$	$6.5 \pm 1$

FIG. 20A

AMPLIFIER 1	13	13	13
AMPLIFIER 2	10	10	10
RAMAN GAIN	$17 \pm 5$	$10 \pm 3.5$	$3 \pm 2$
REPEATER GAIN	$30 \pm 3$	$25 \pm 2$	$20 \pm 1$

FIG. 20B

COMPENSATION FOR INPUT LEVEL FLUCTUATION  
DUE TO RAMAN AMPLIFYING EFFECT

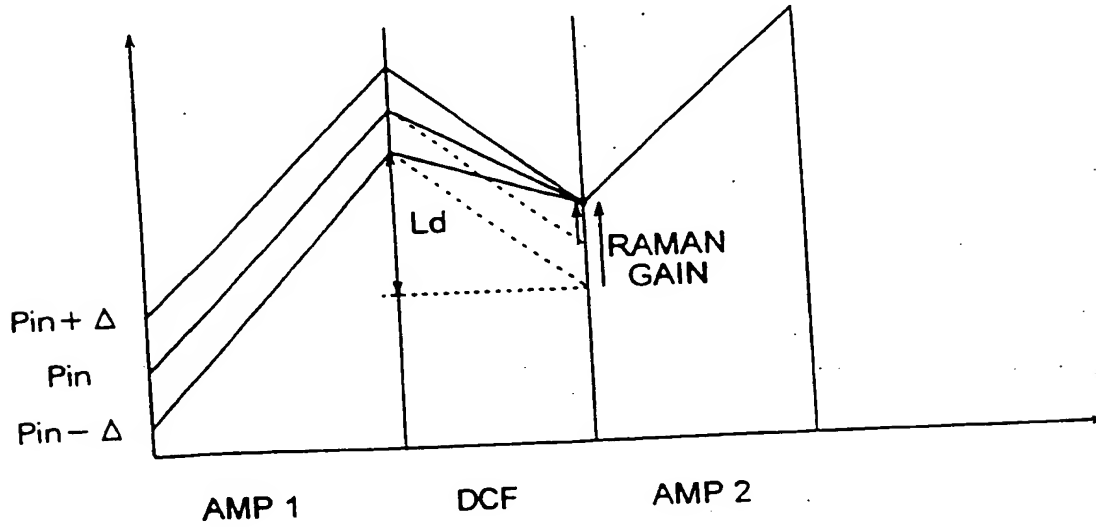


FIG. 21A

COMPENSATION FOR FLUCTUATION IN LOSS OF  
DCF DUE TO RAMAN AMPLIFYING EFFECT

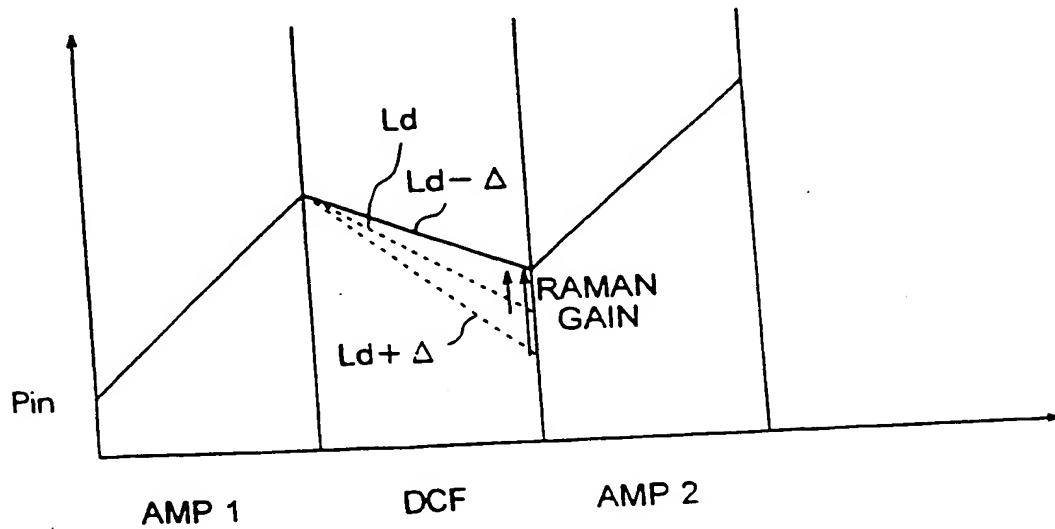


FIG. 21B

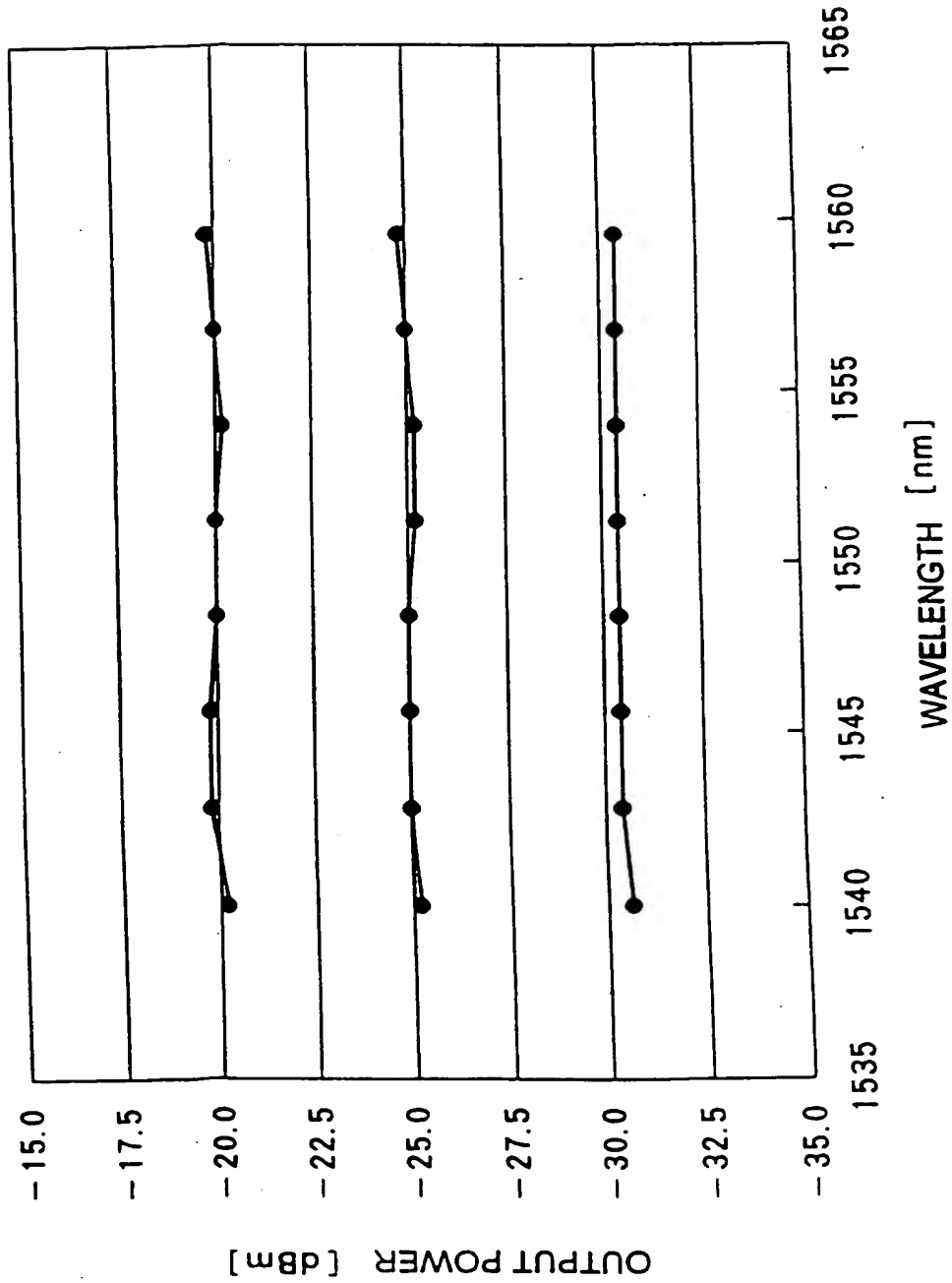


FIG. 22

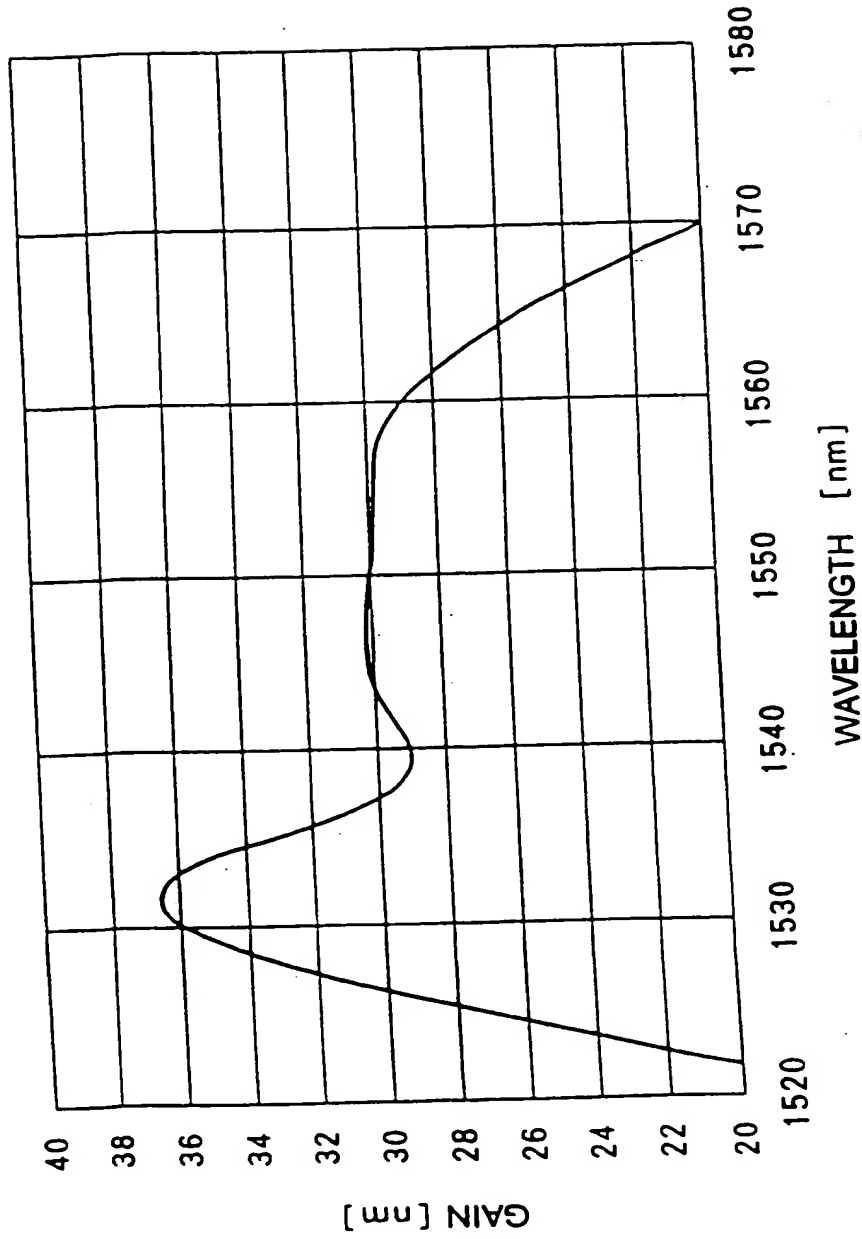


FIG. 23

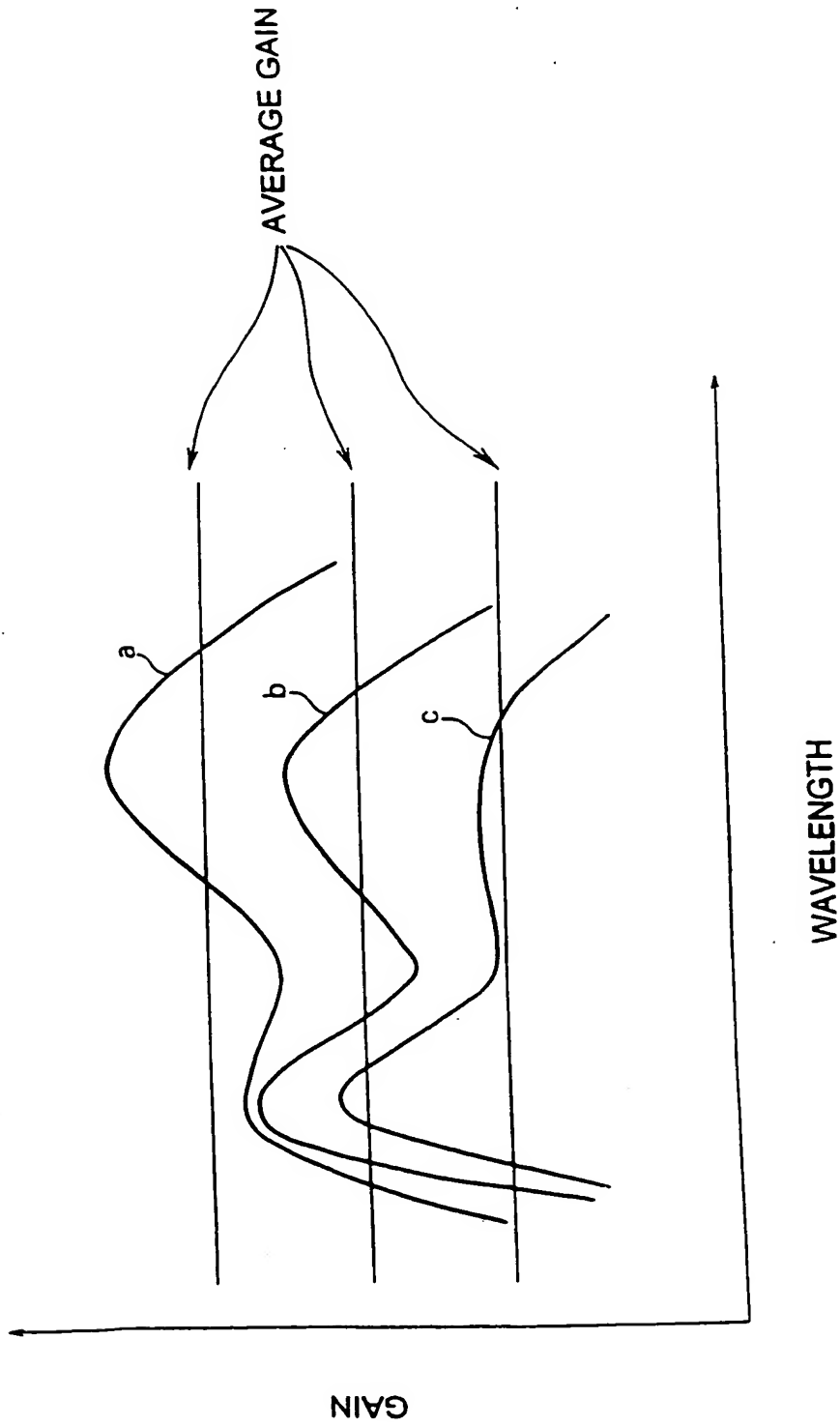


FIG. 24

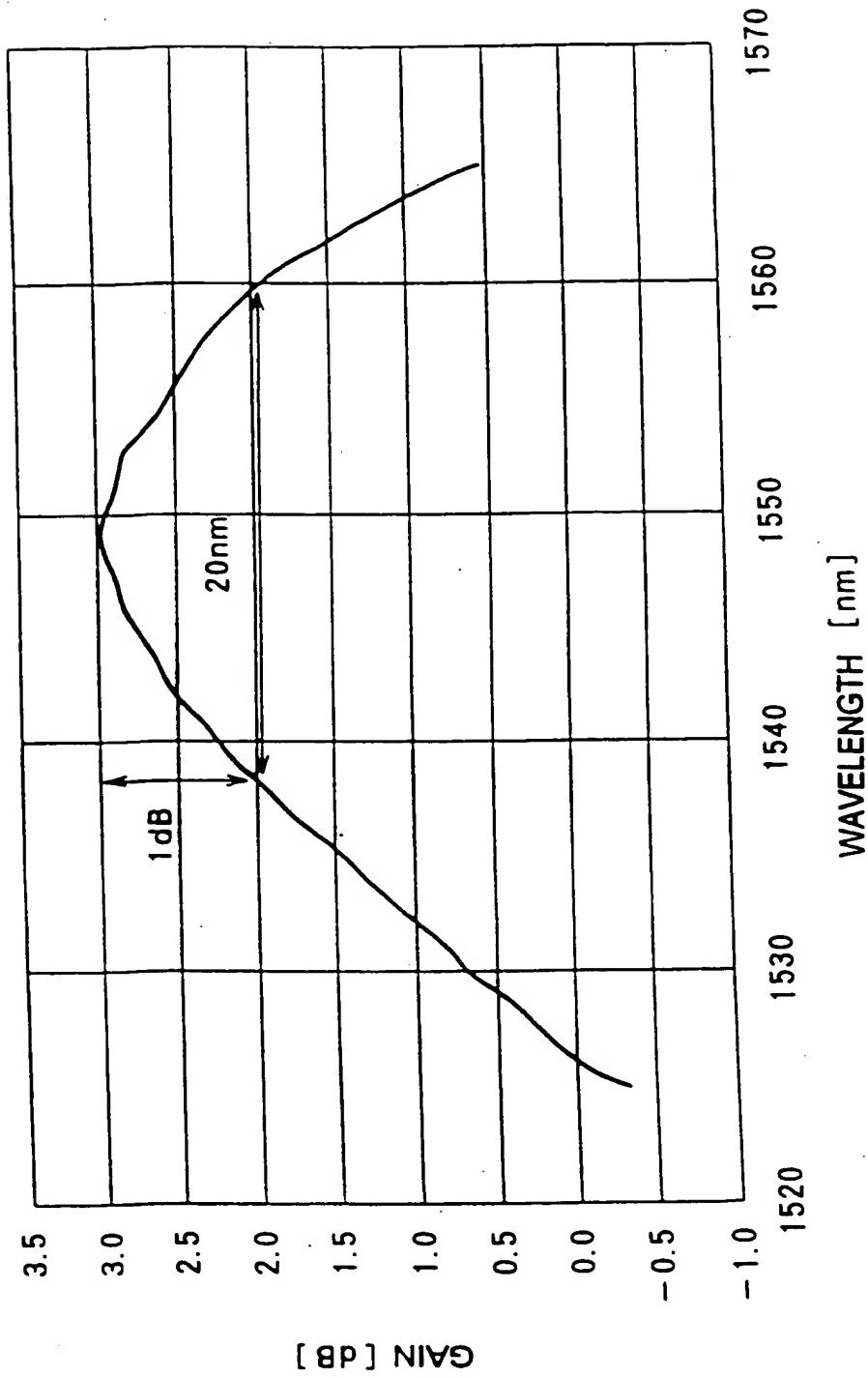


FIG. 25

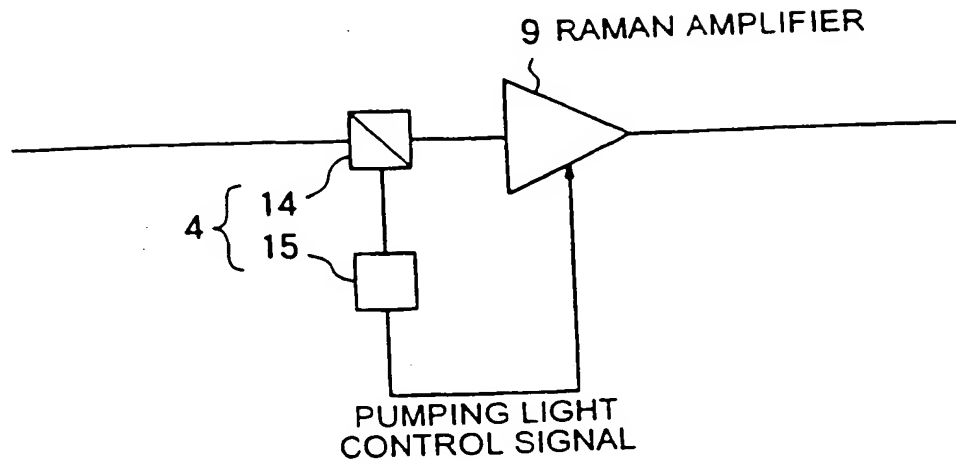


FIG. 26

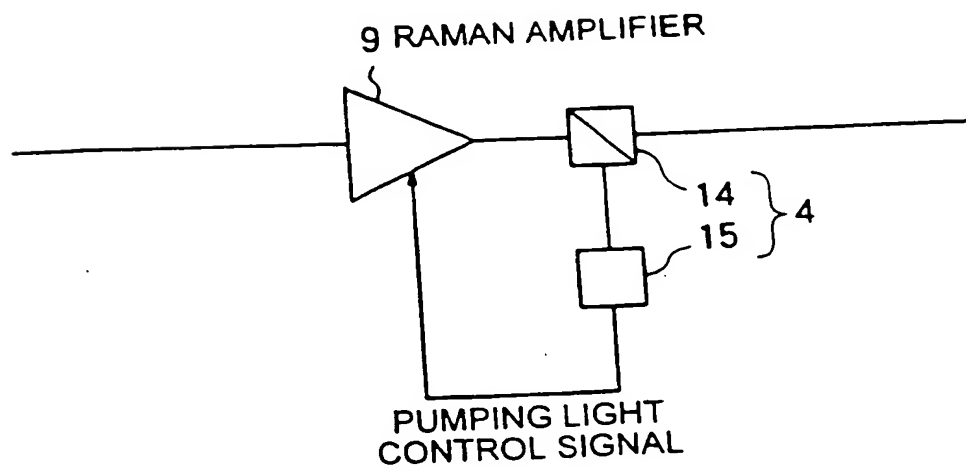


FIG. 27



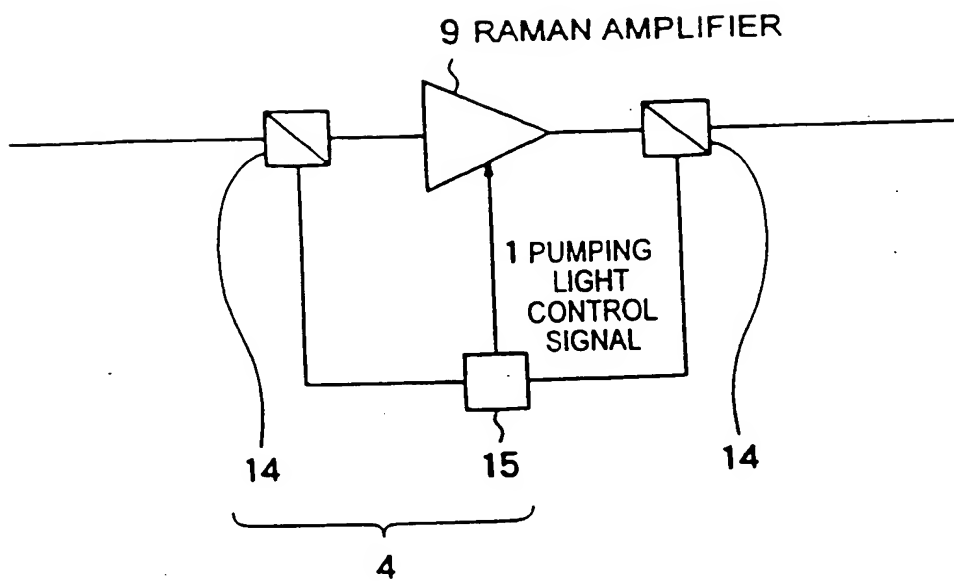


FIG. 28

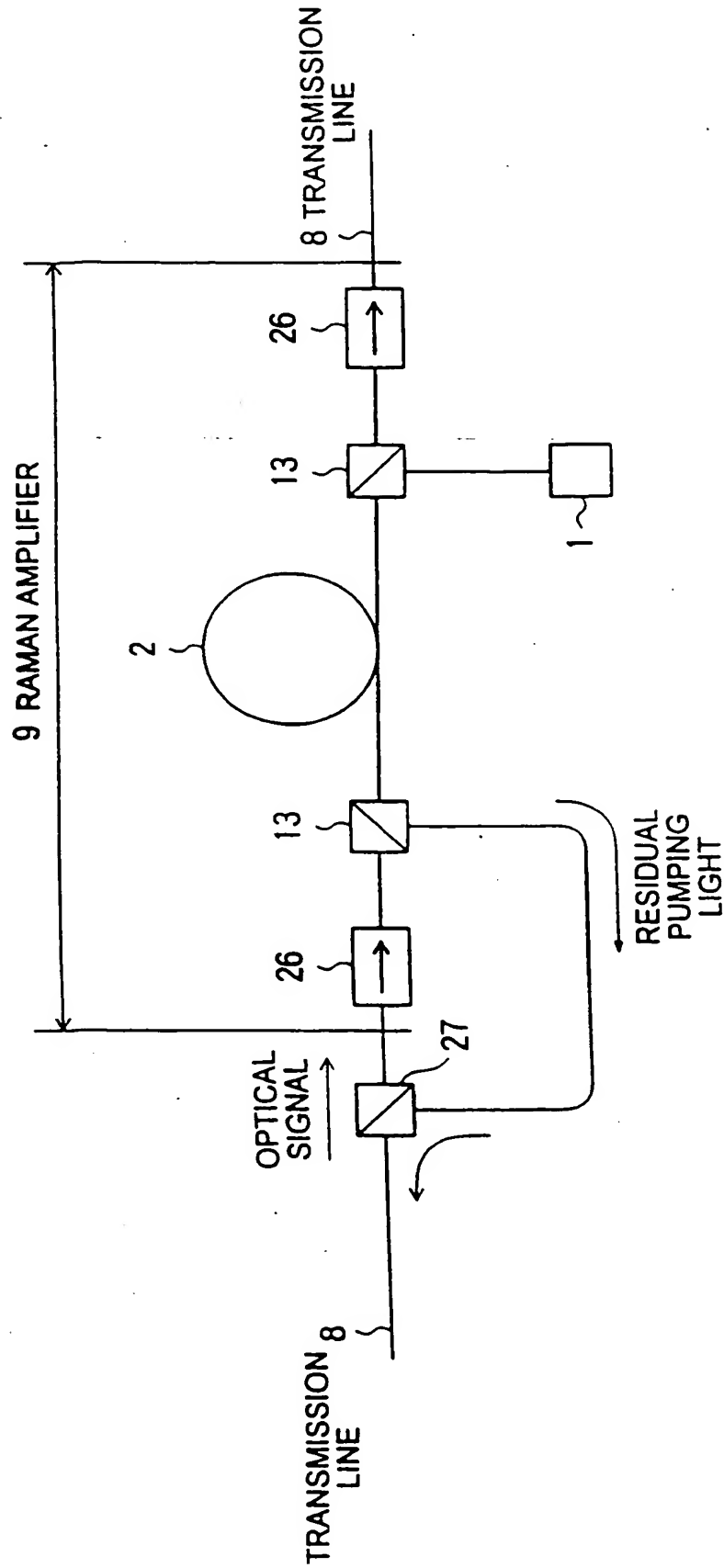


FIG. 29

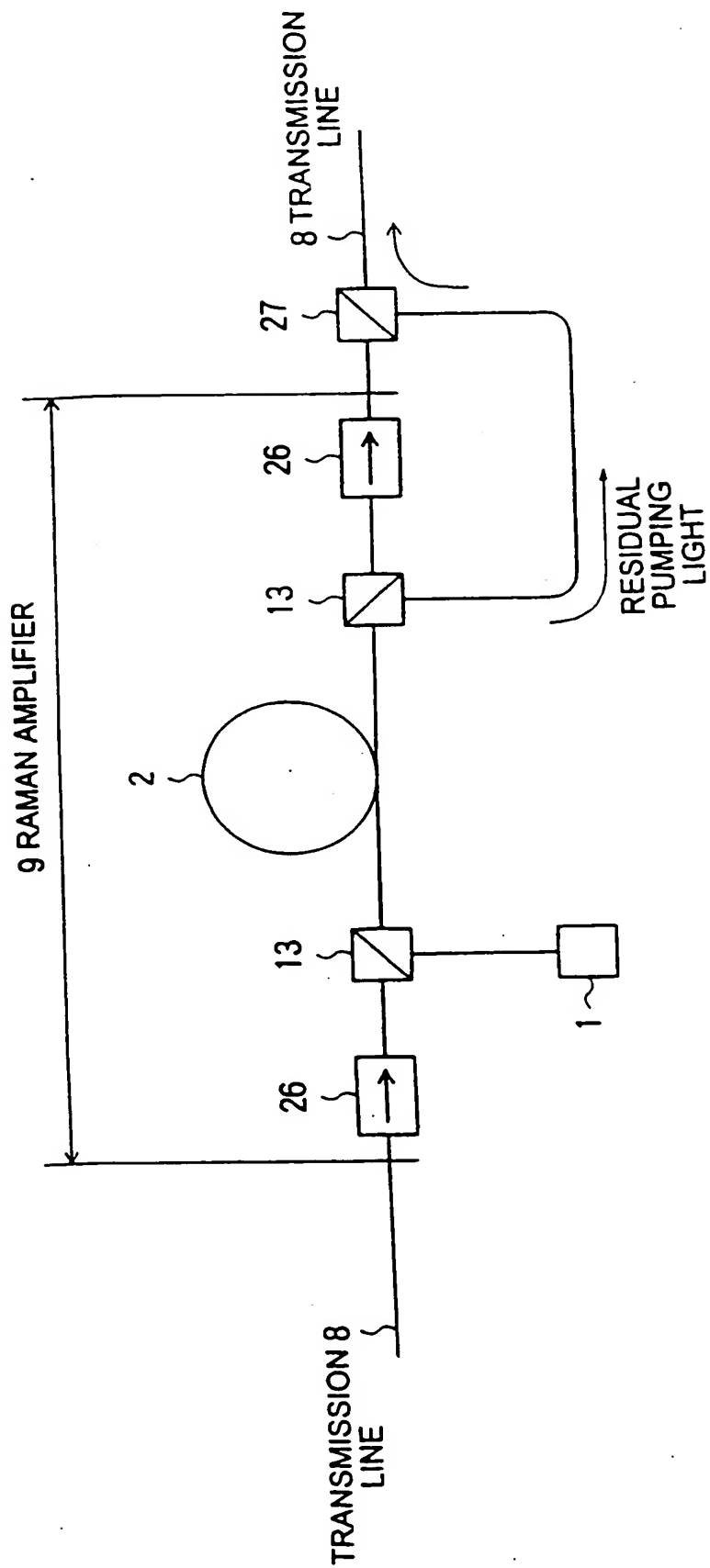


FIG. 30

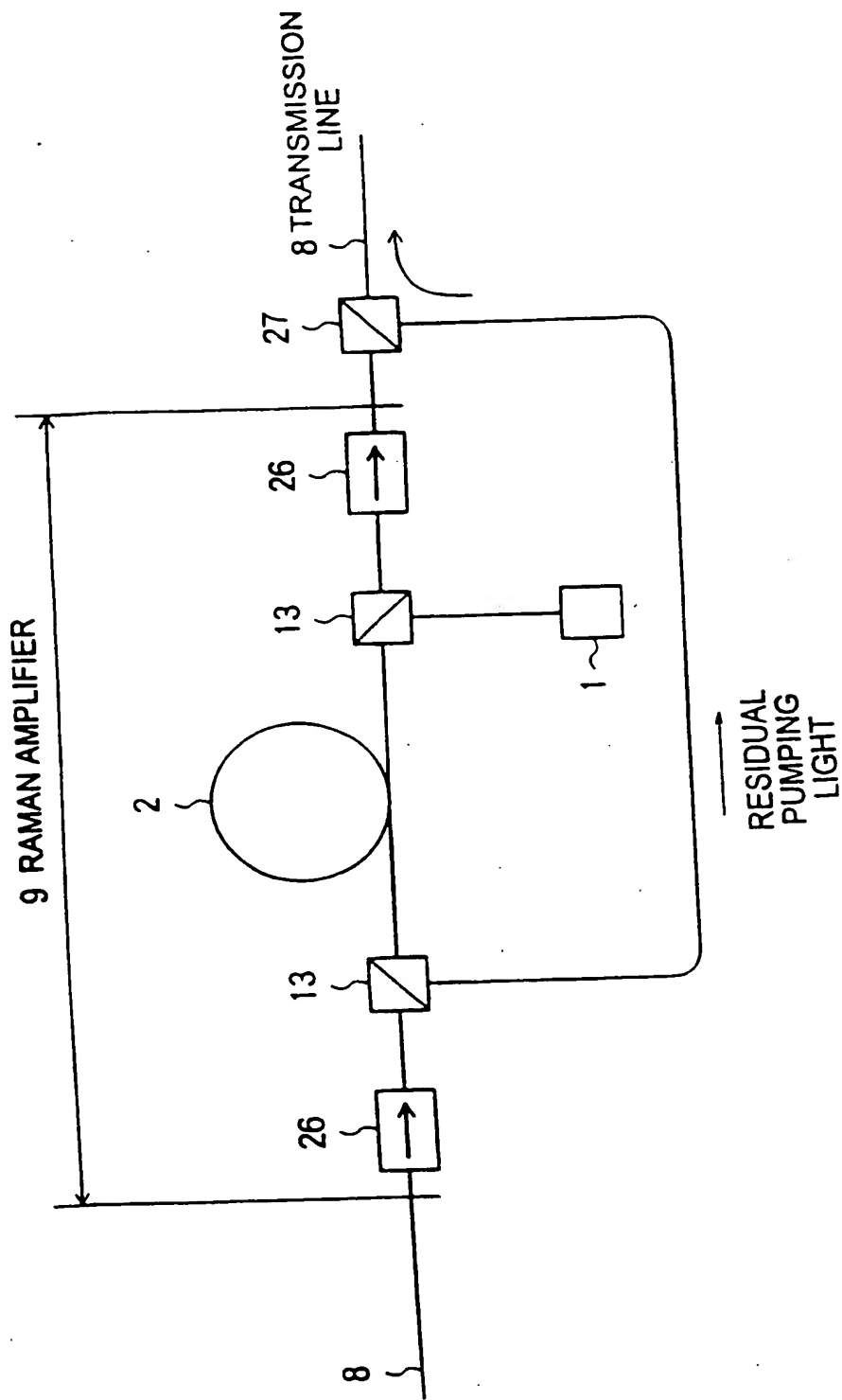


FIG. 31

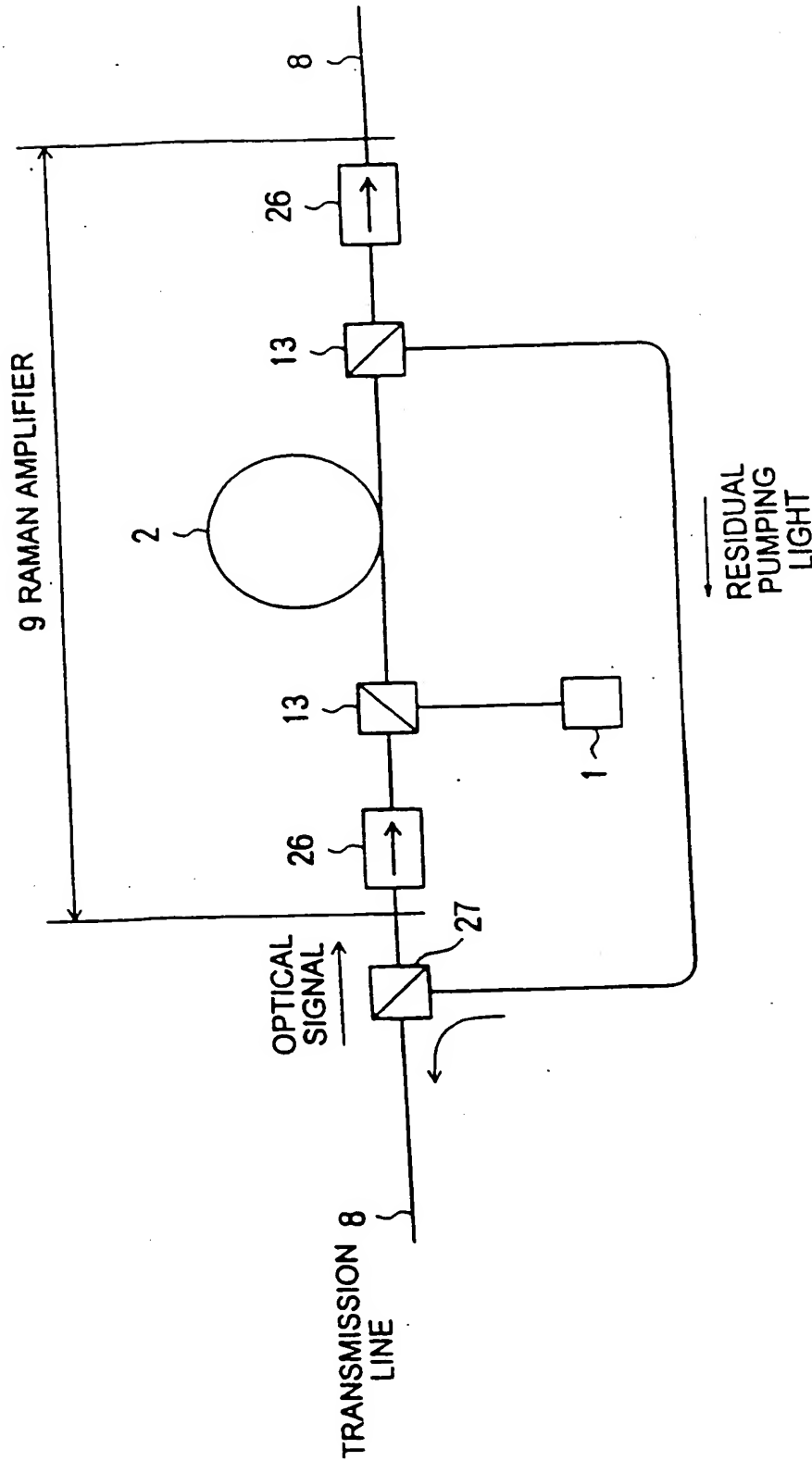


FIG. 32

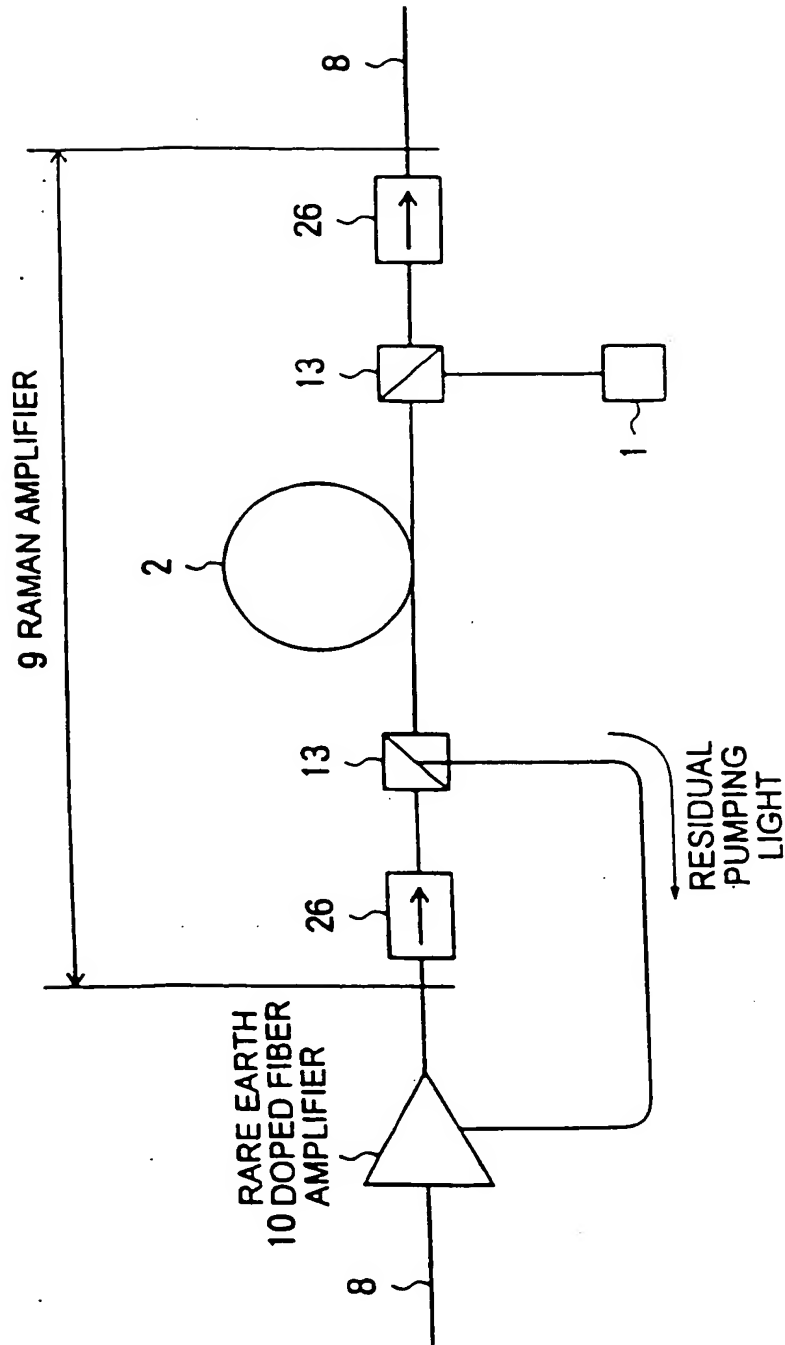


FIG. 33

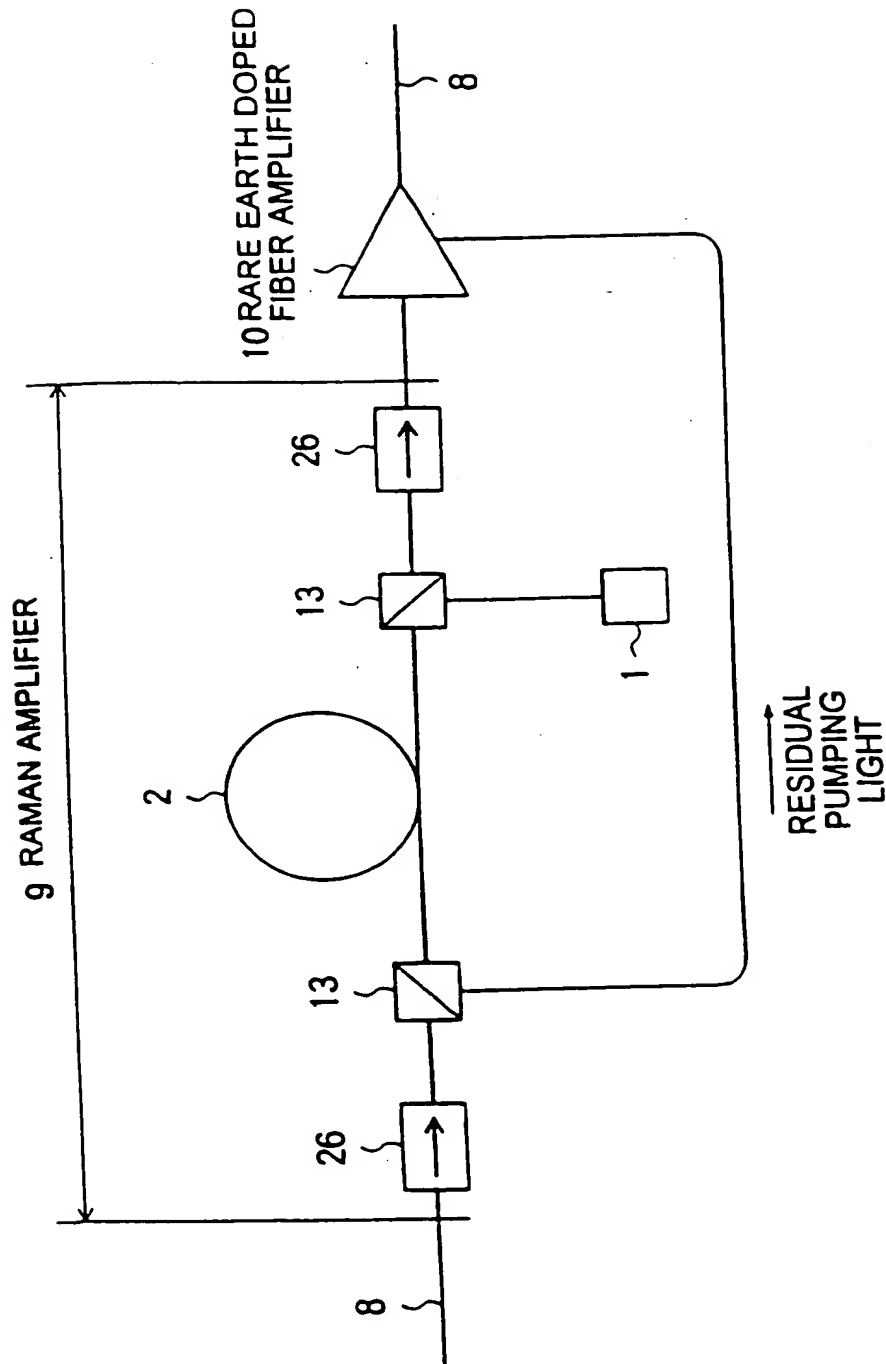


FIG. 34

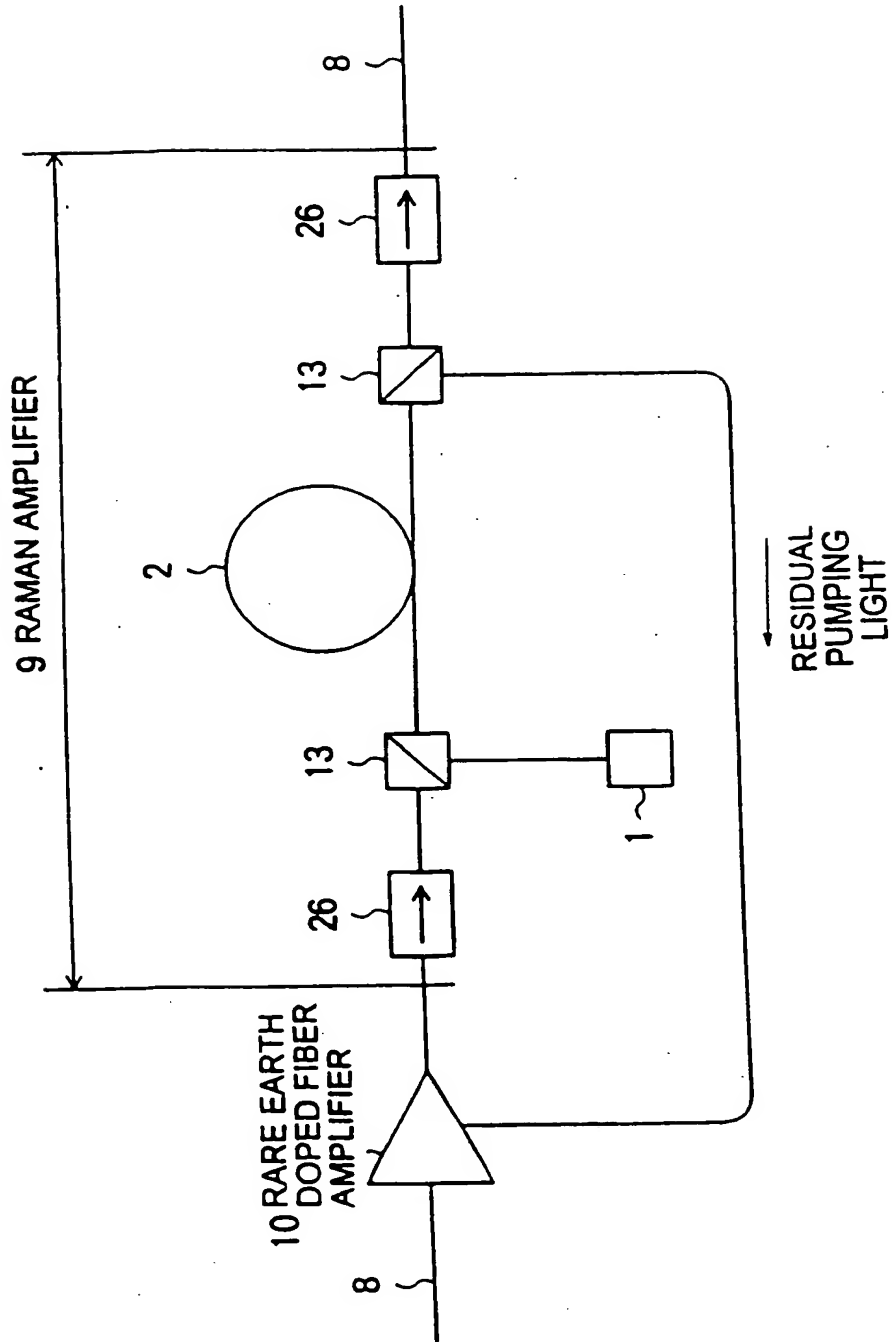


FIG. 35



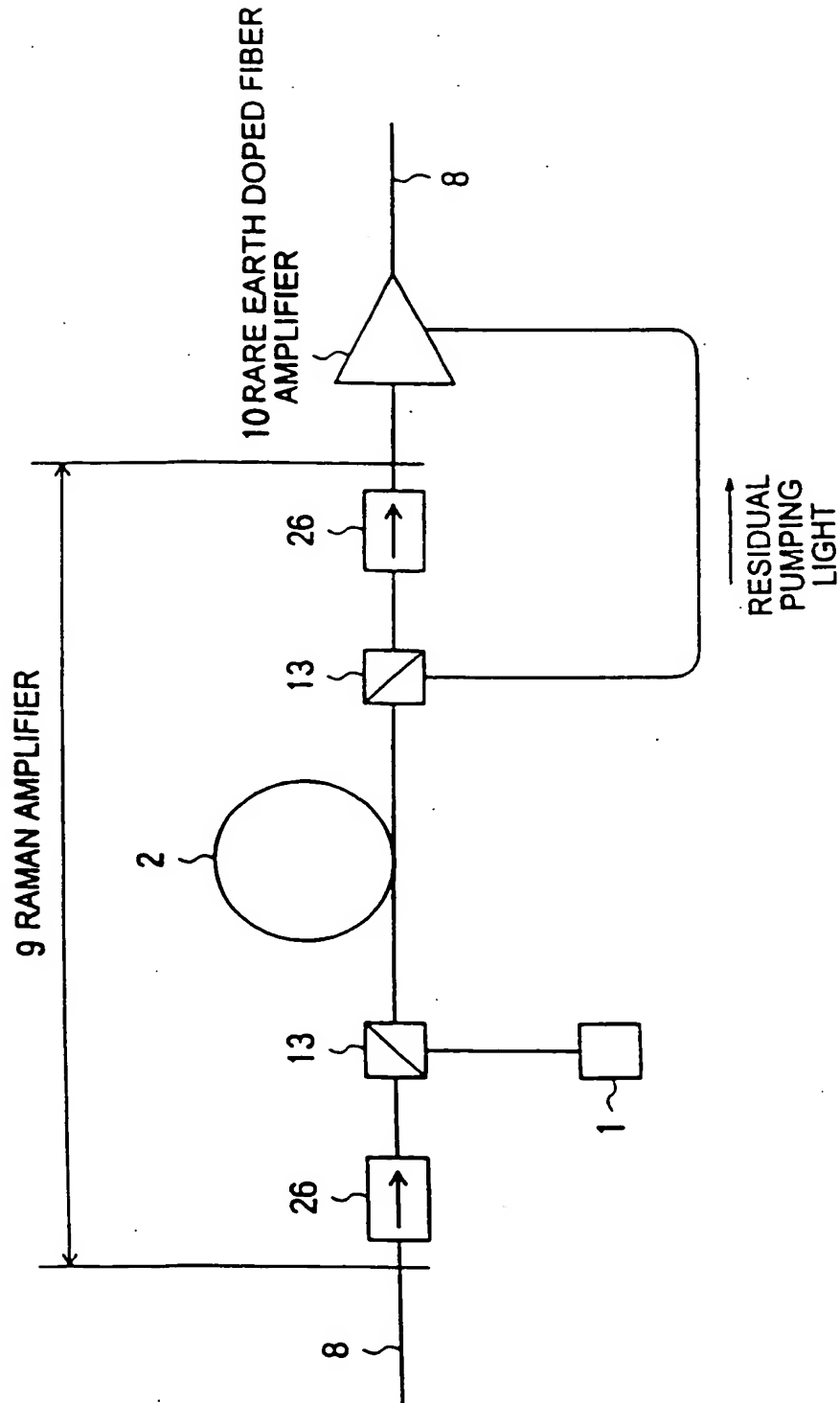


FIG. 36

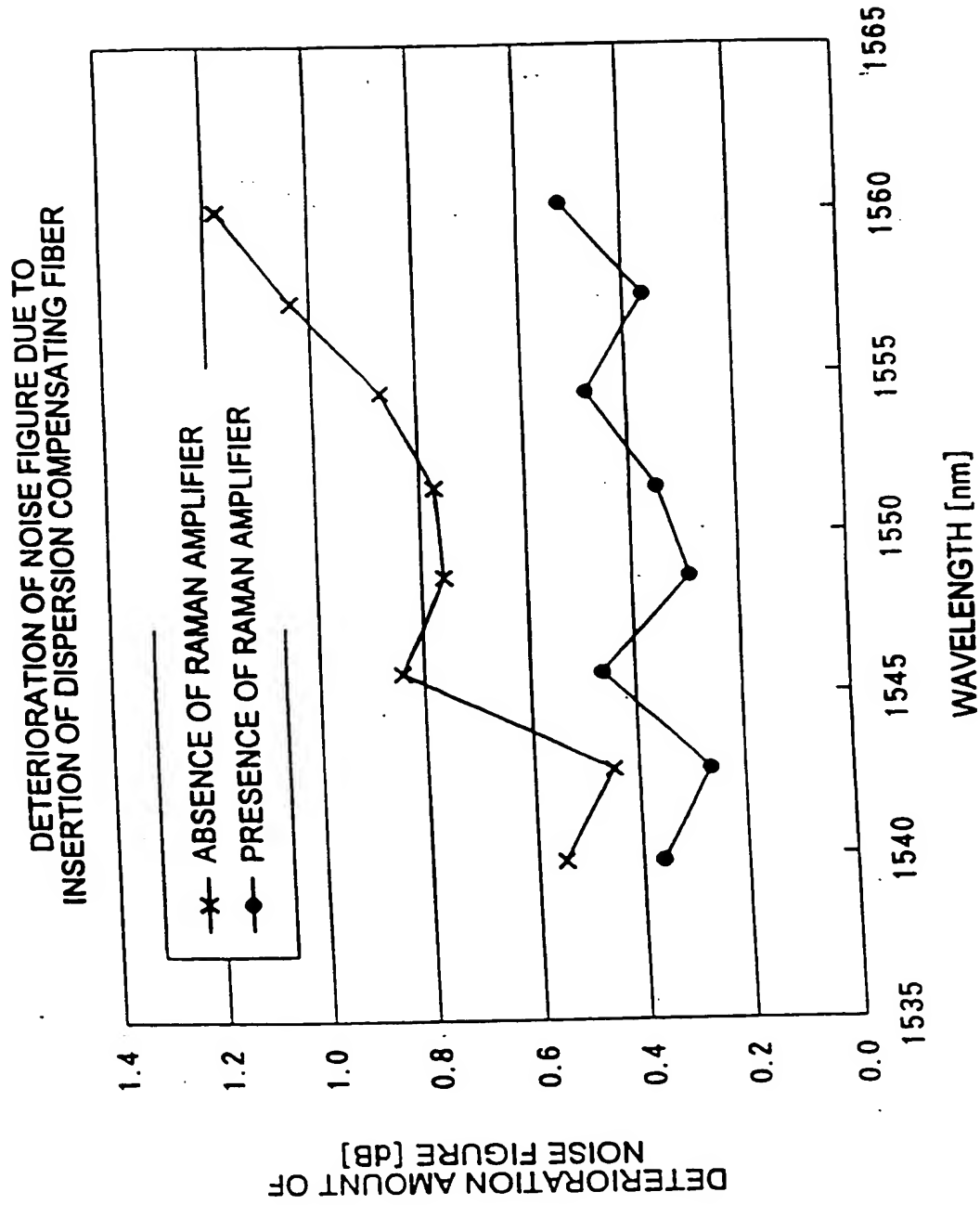


FIG. 37

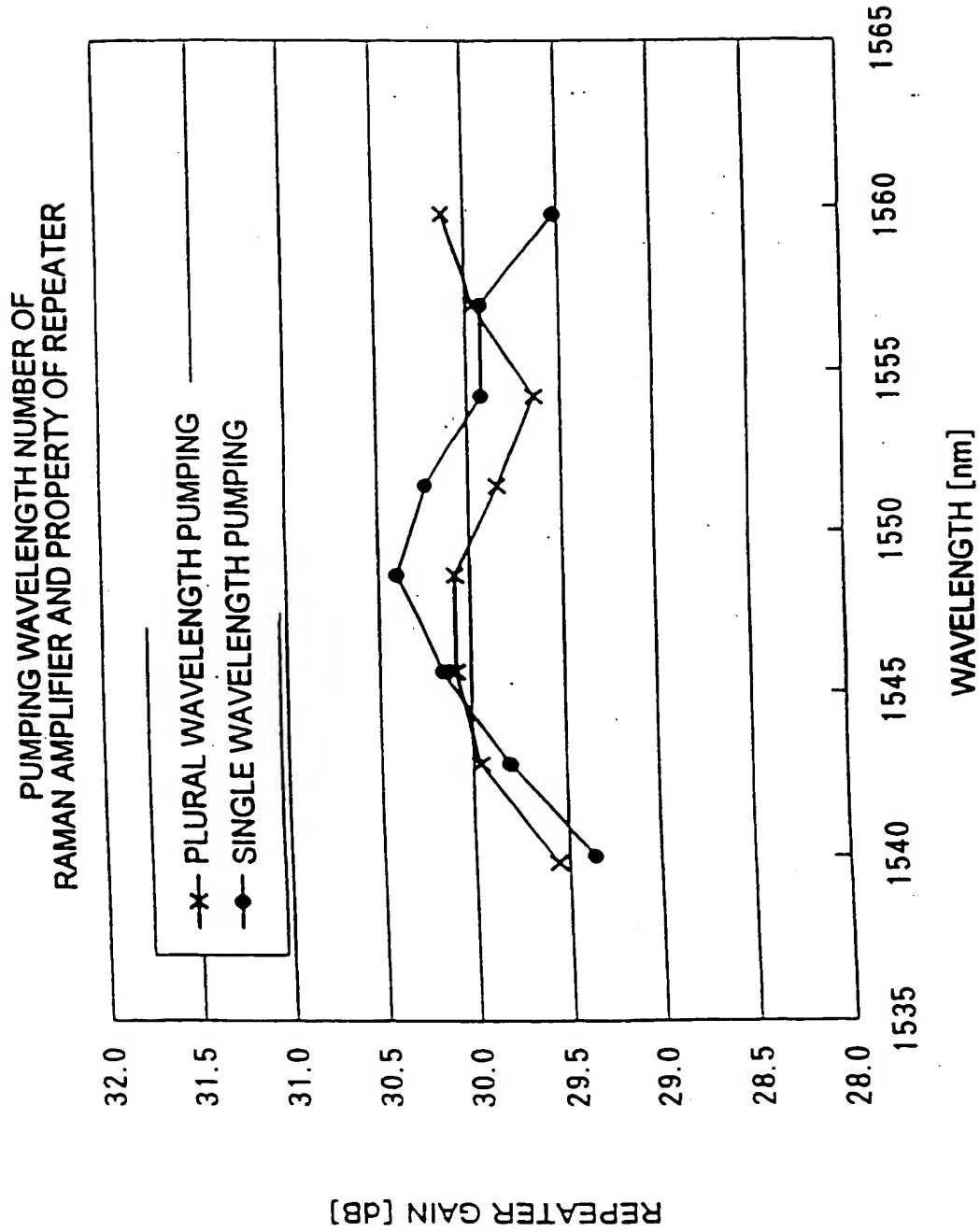


FIG. 38

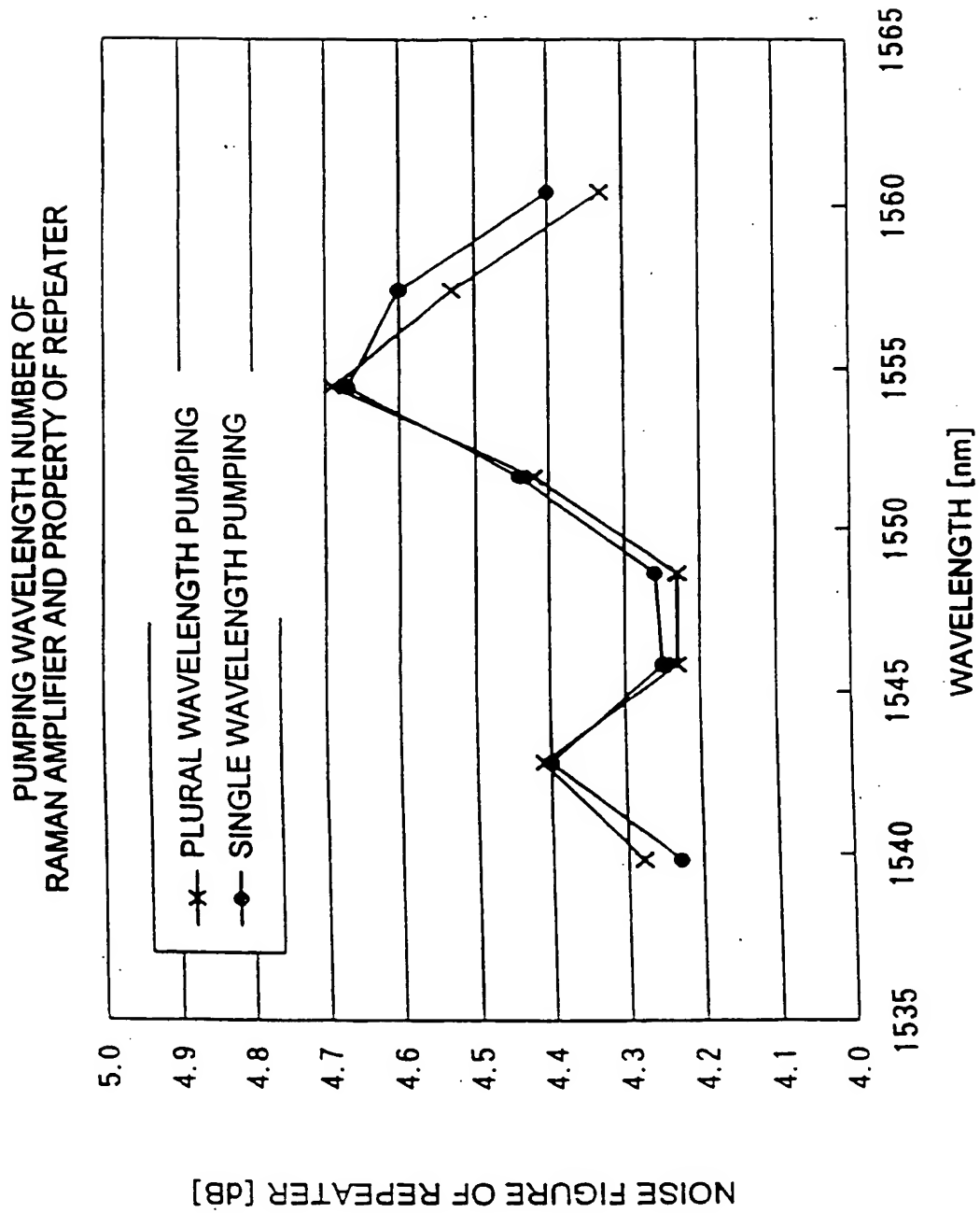


FIG. 39

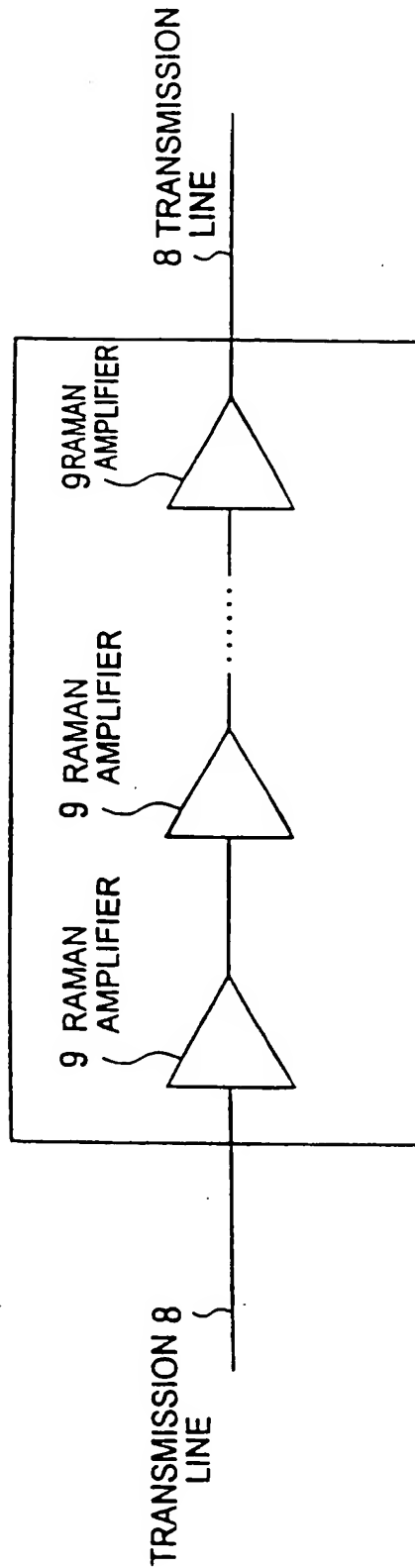


FIG. 40

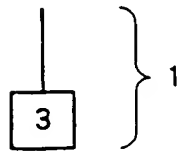


FIG. 41

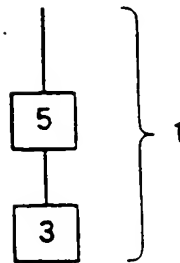


FIG. 42

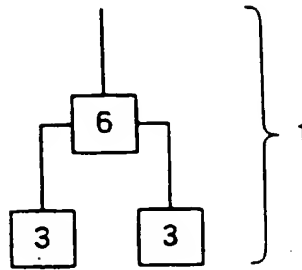


FIG. 43

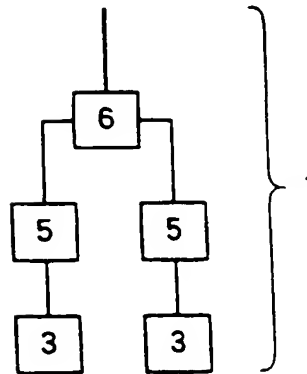


FIG. 44

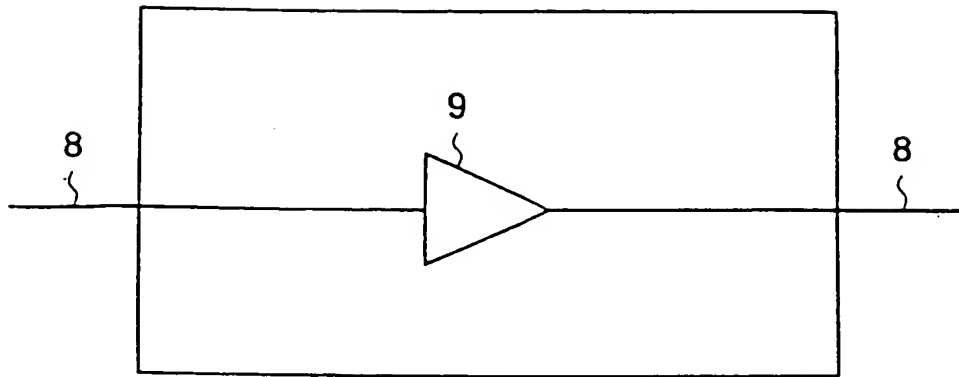


FIG. 45

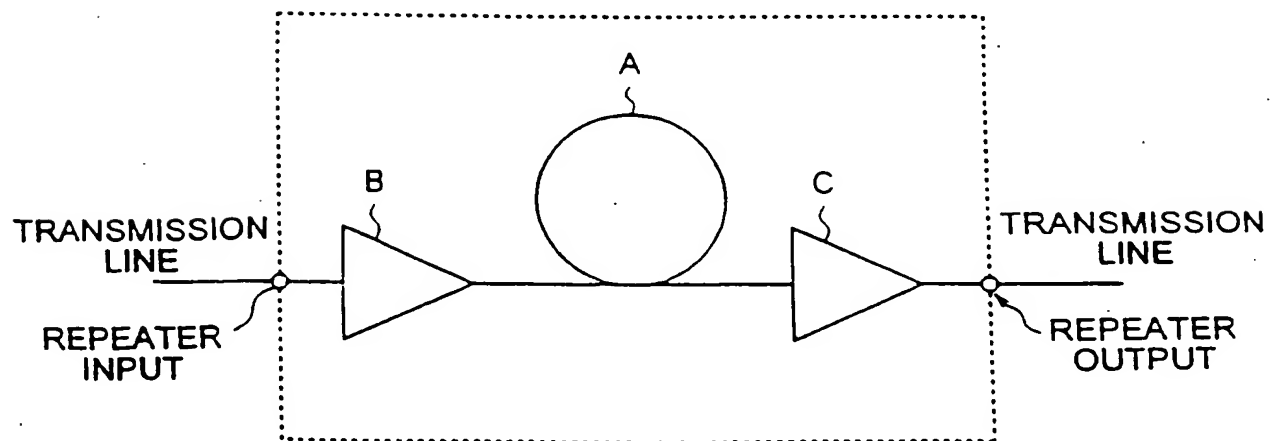


FIG. 46  
PRIOR ART



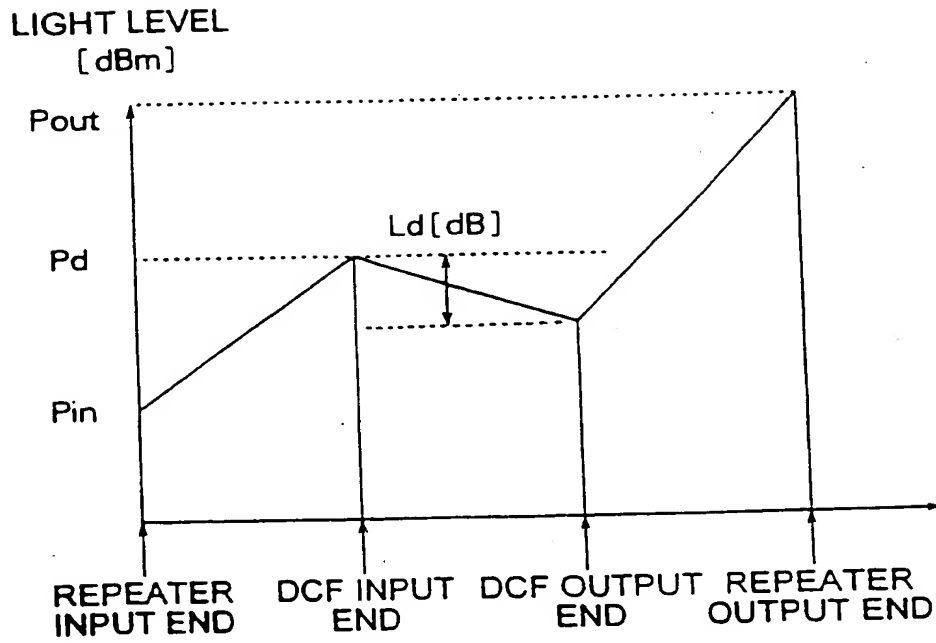


FIG. 47

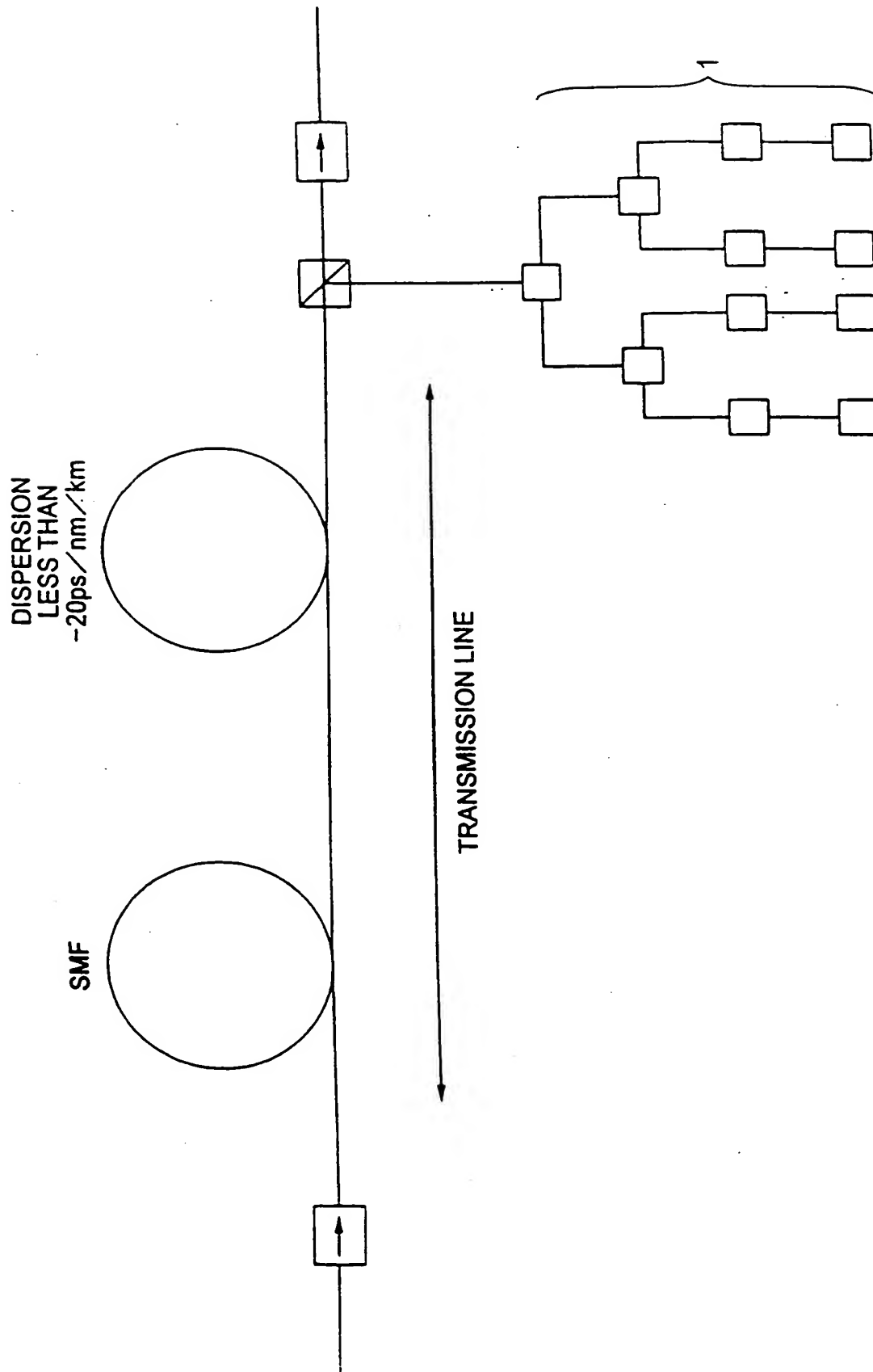


FIG. 48

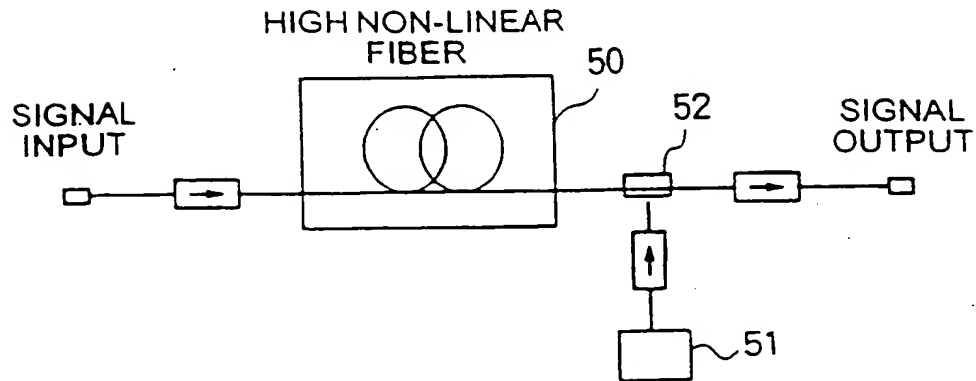


FIG. 49

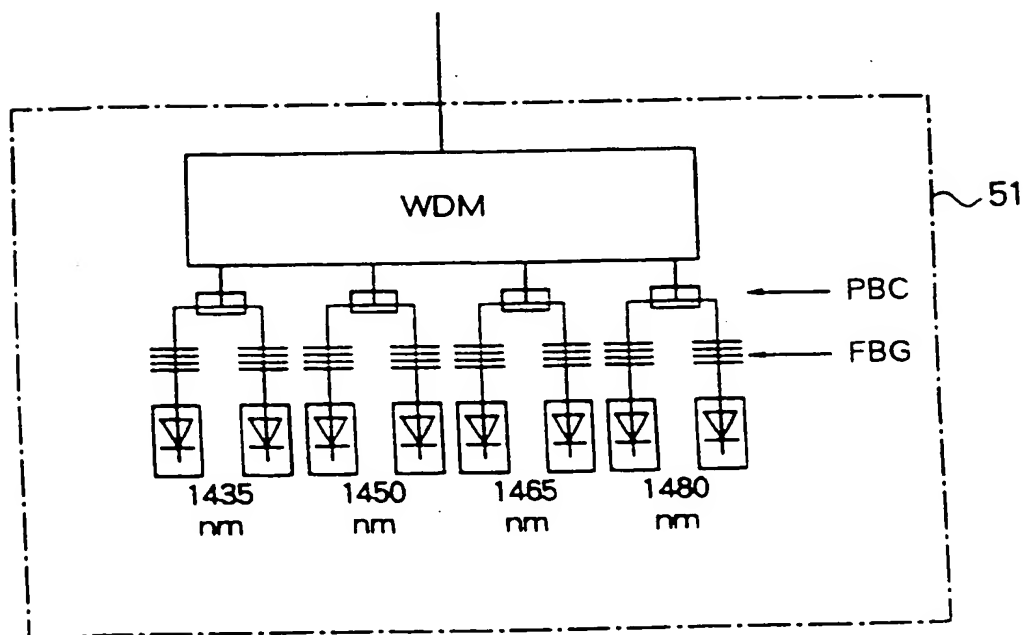


FIG. 50

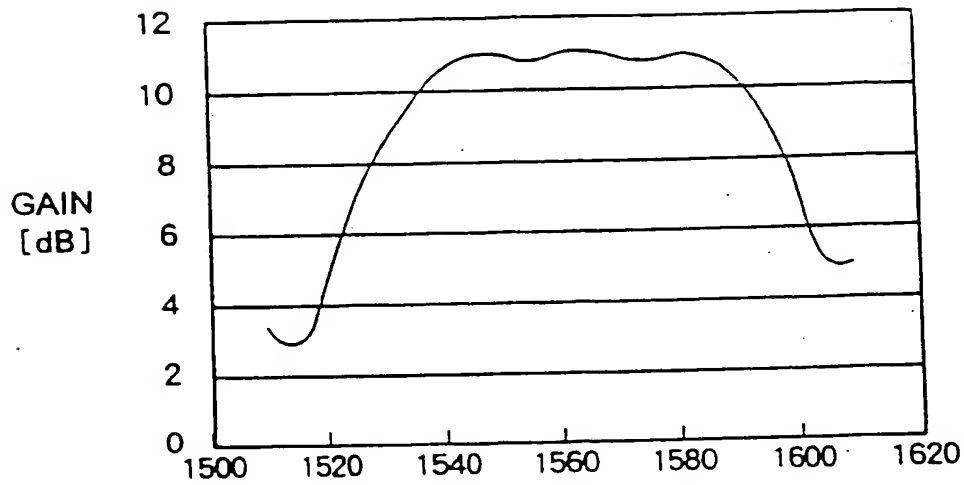


FIG. 51

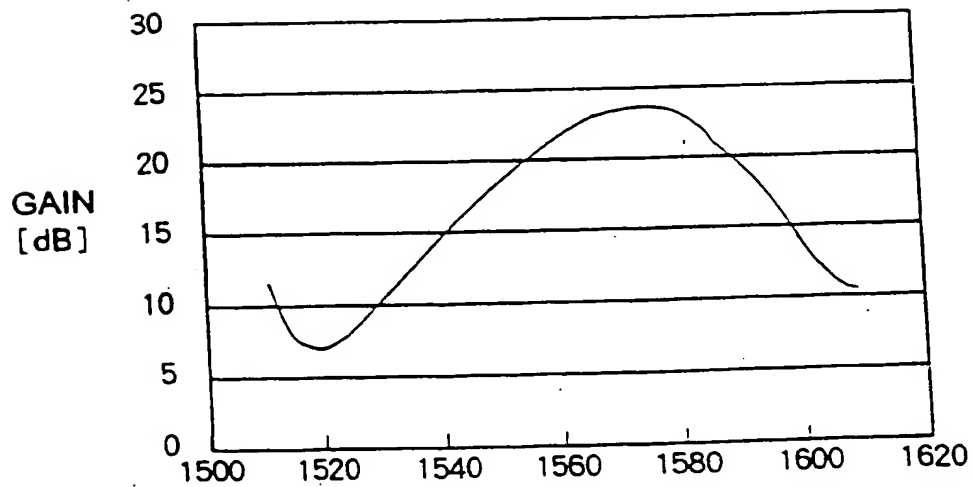


FIG. 52

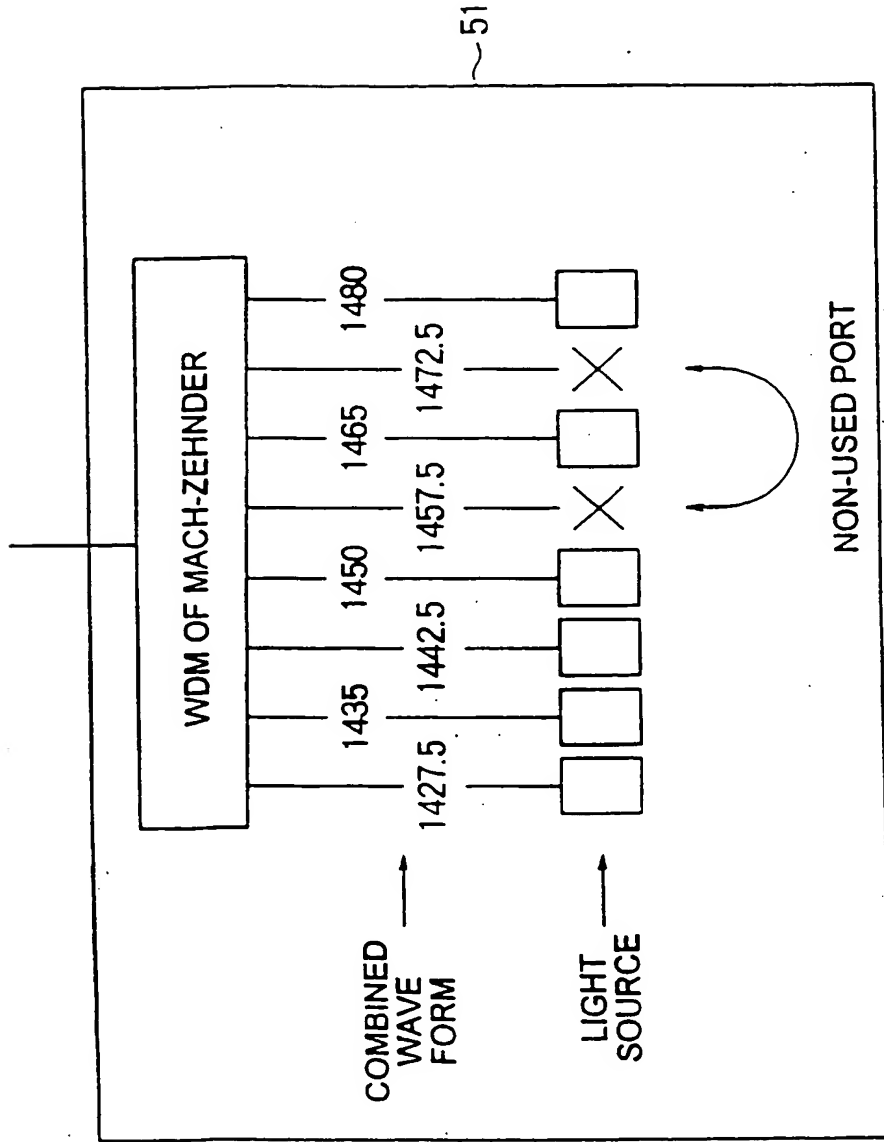


FIG. 53

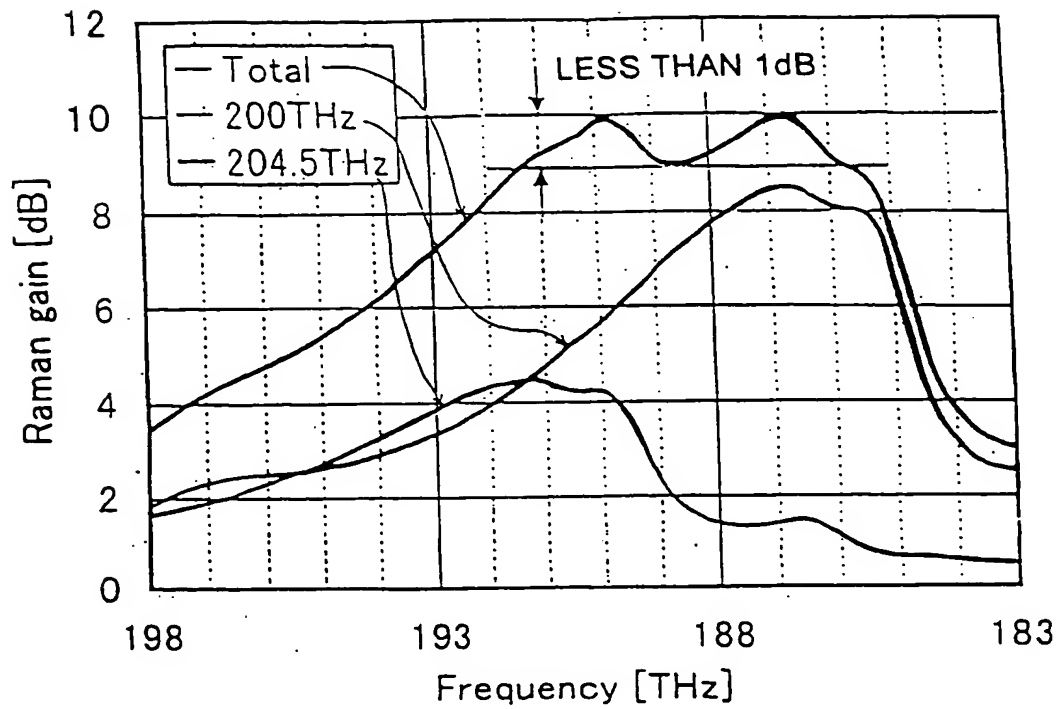


FIG. 54A

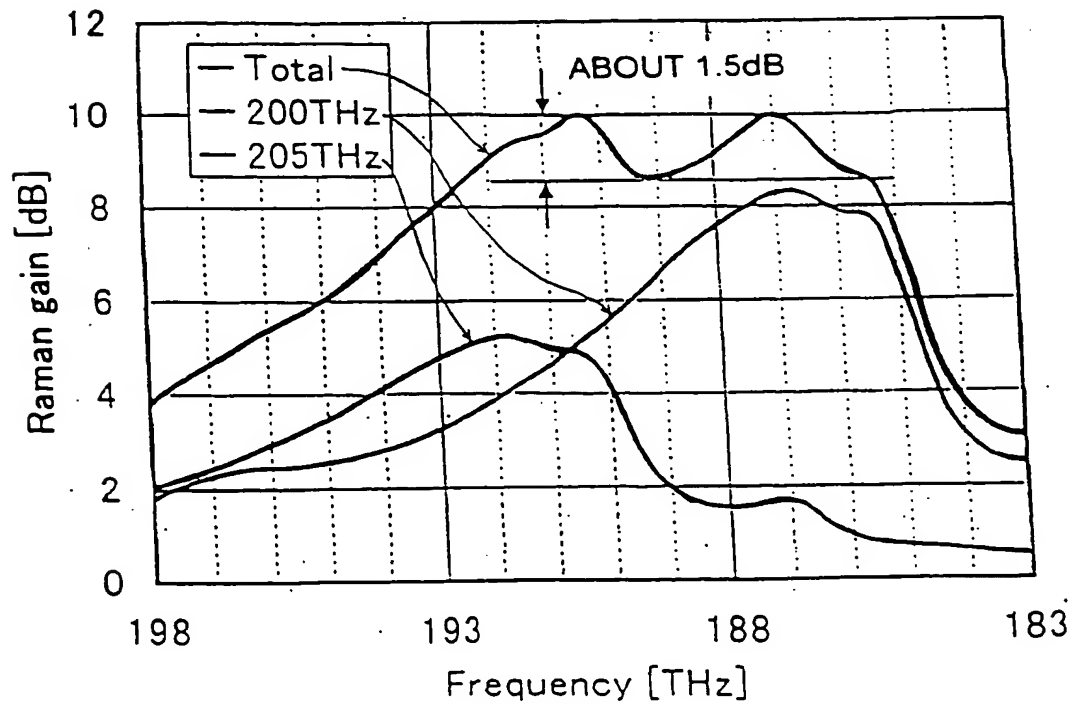


FIG. 54B

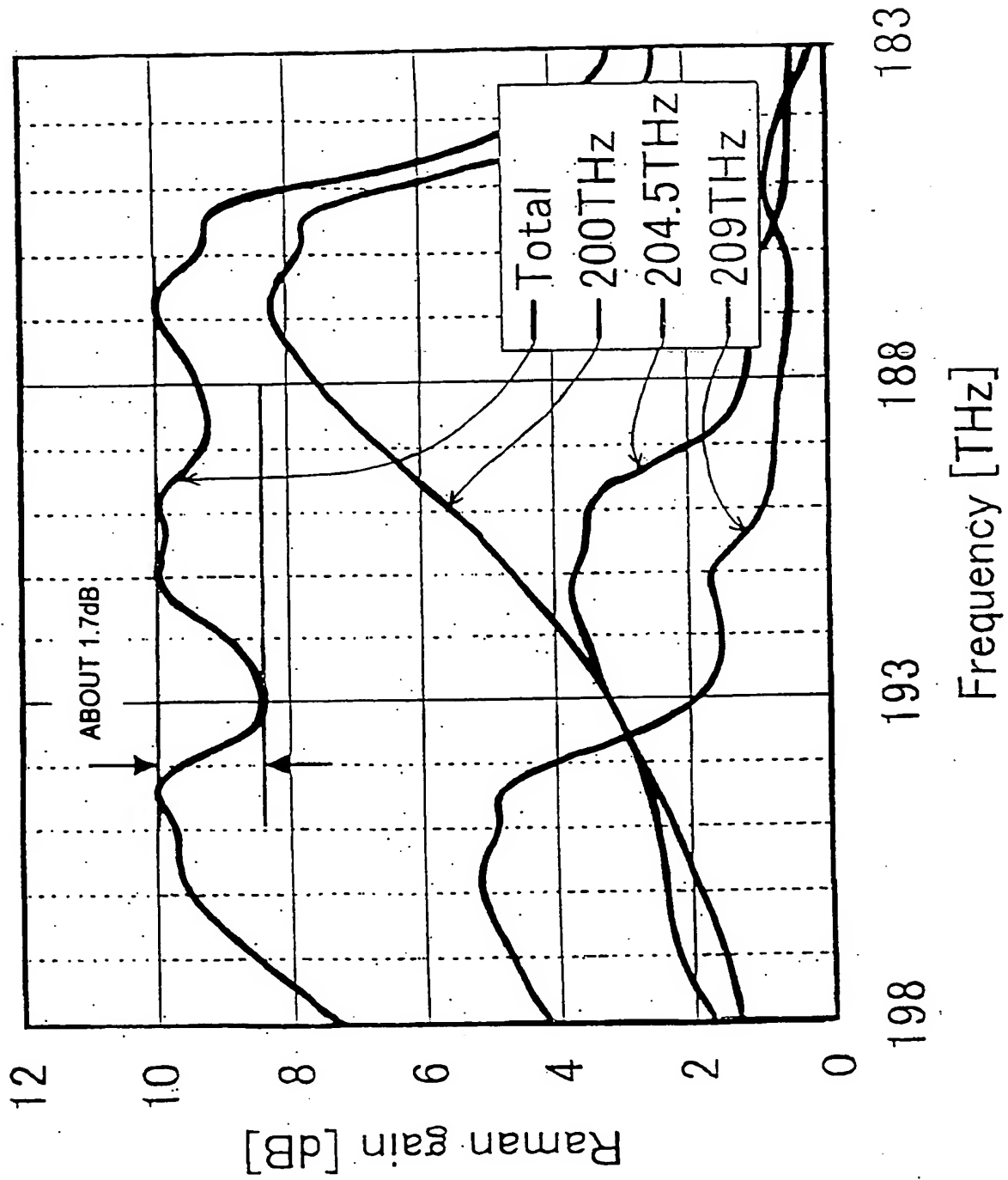


FIG. 55

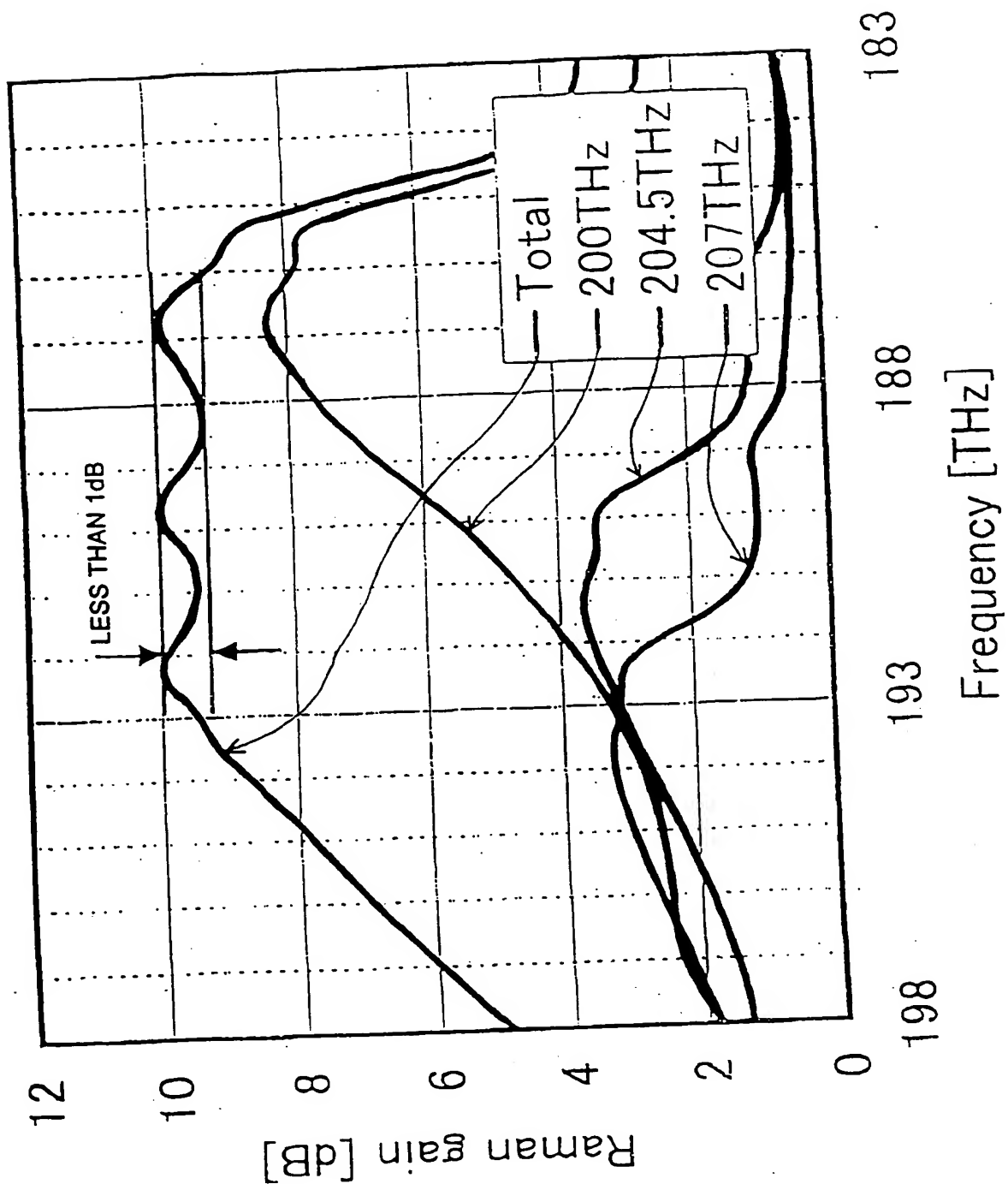


FIG. 56



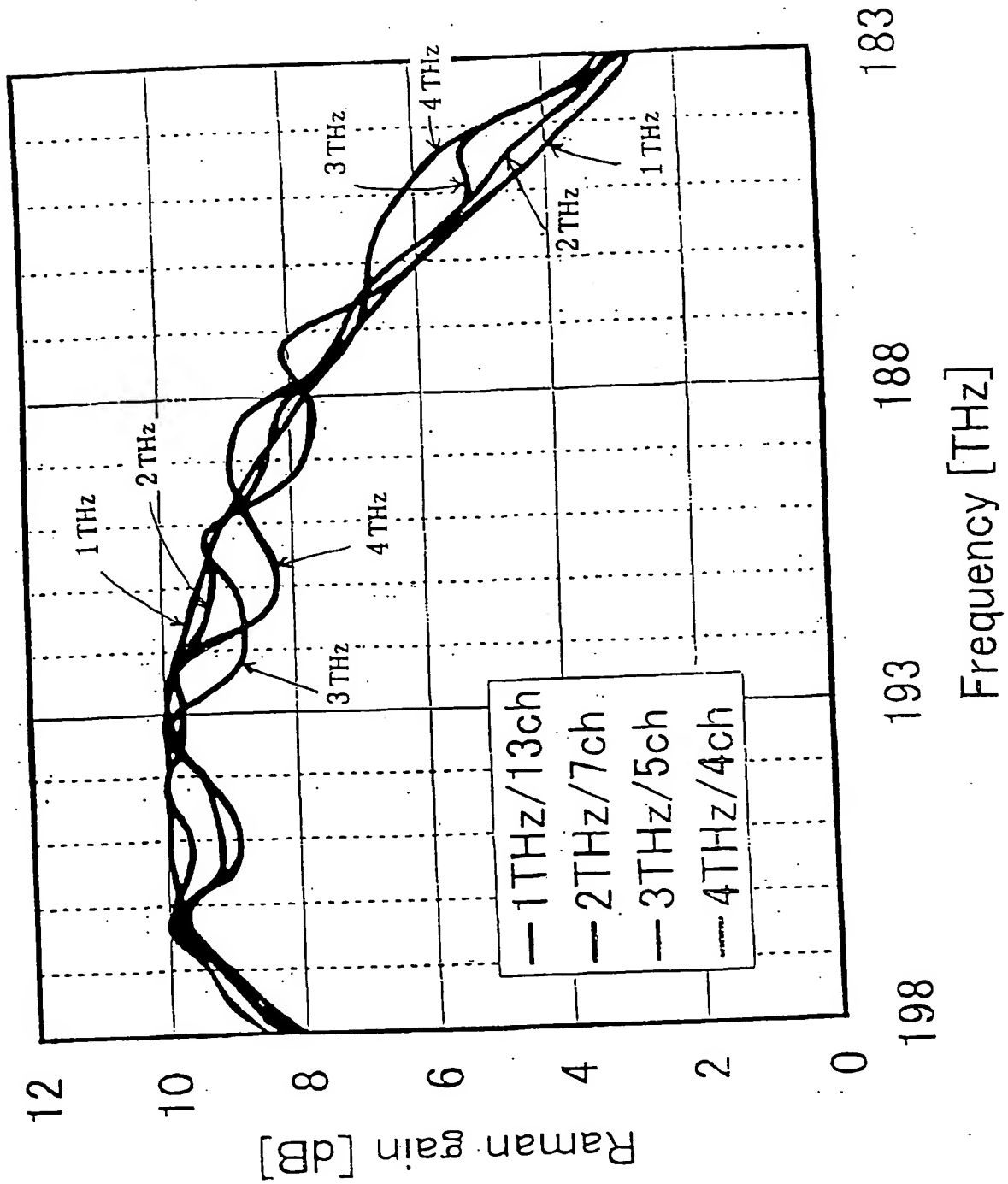


FIG. 57

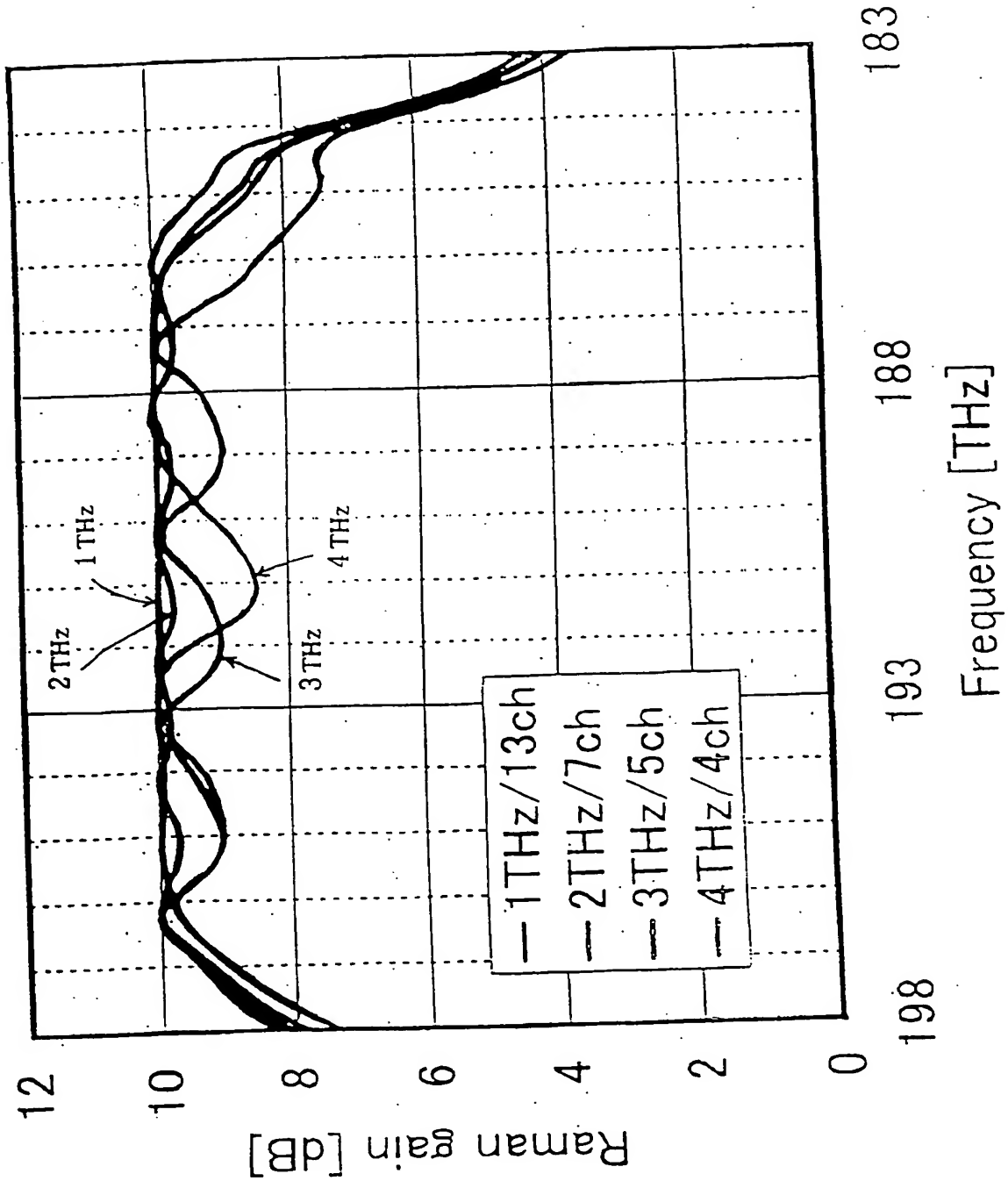


FIG. 58

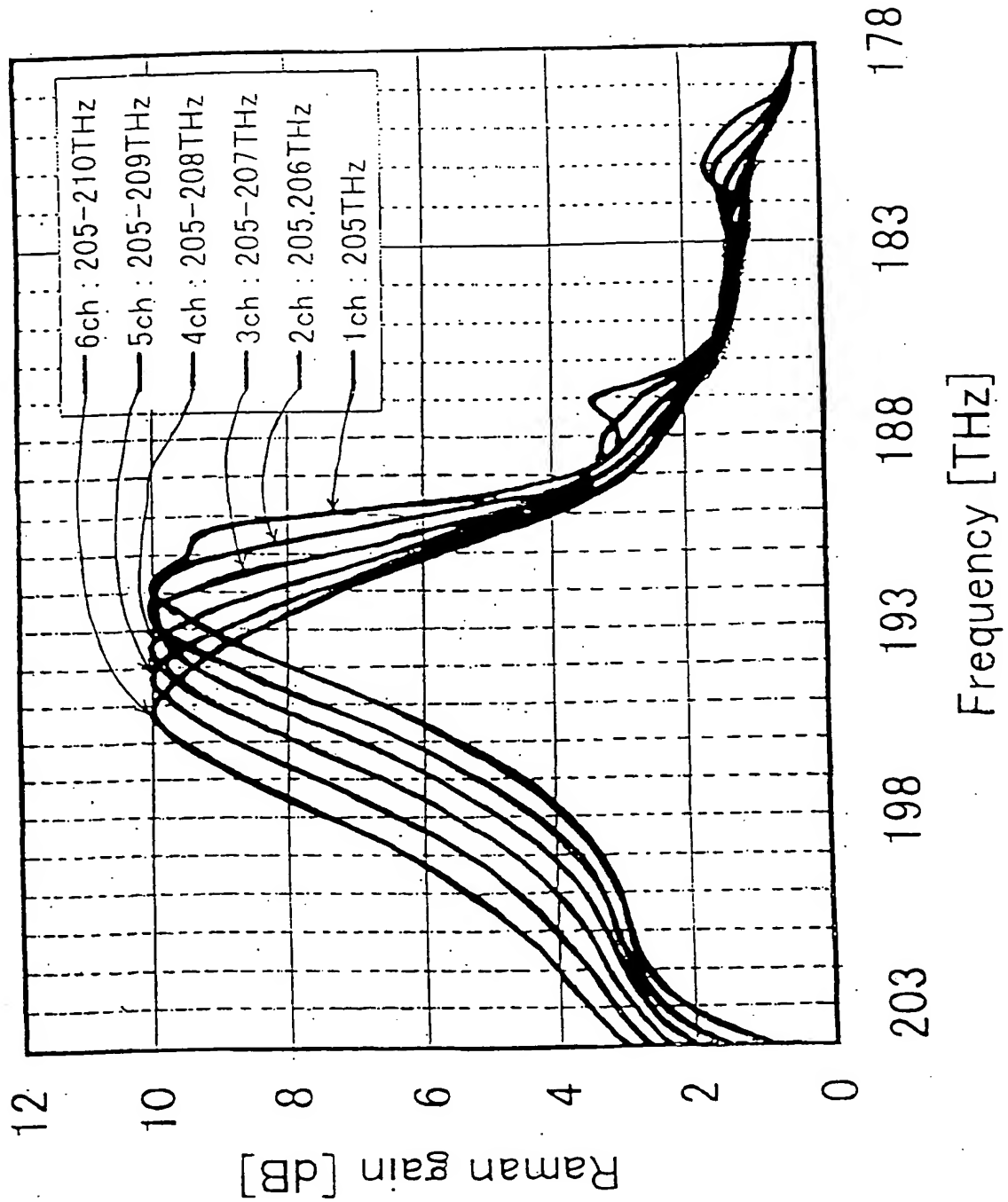


FIG. 59

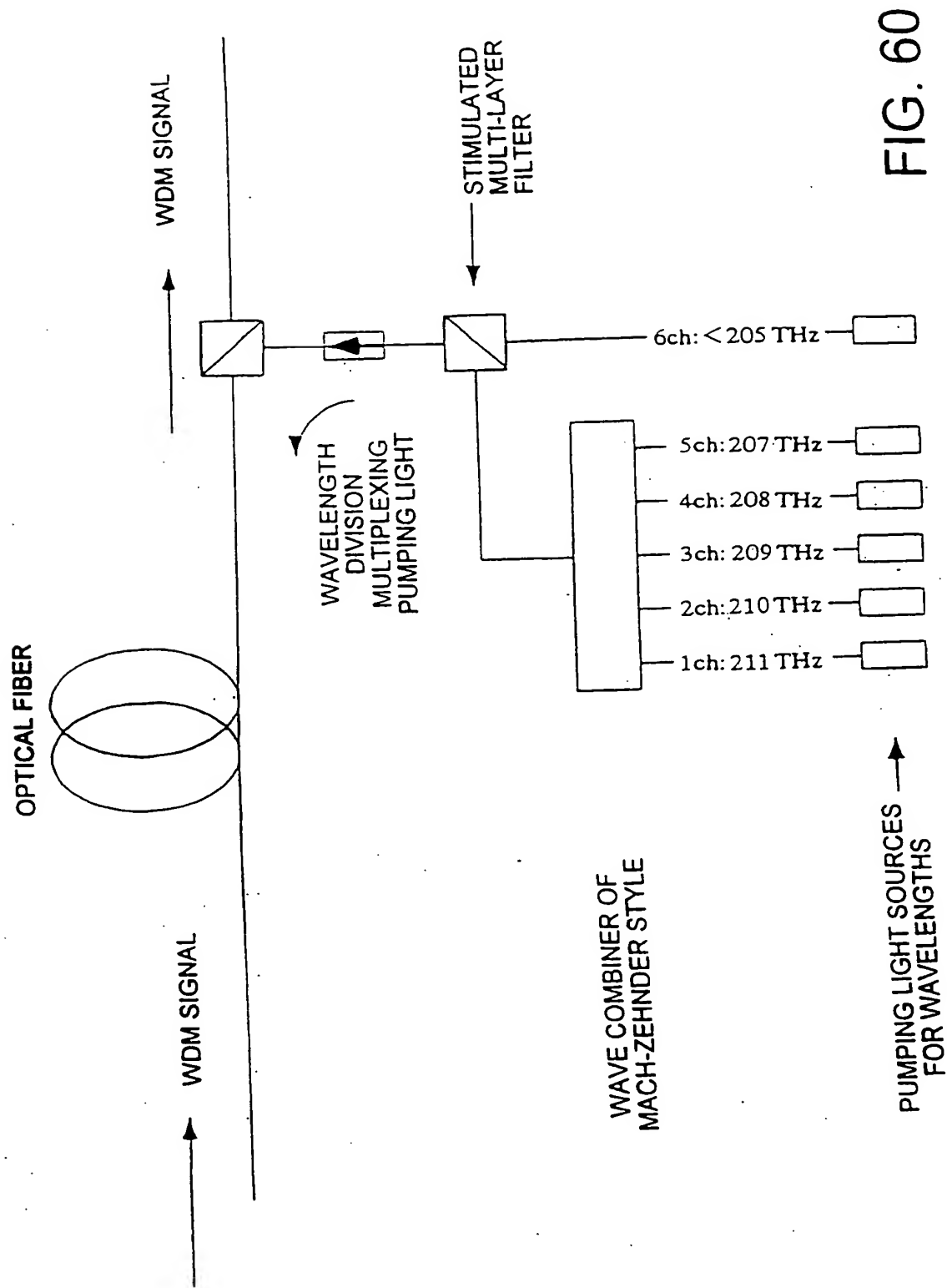


FIG. 60

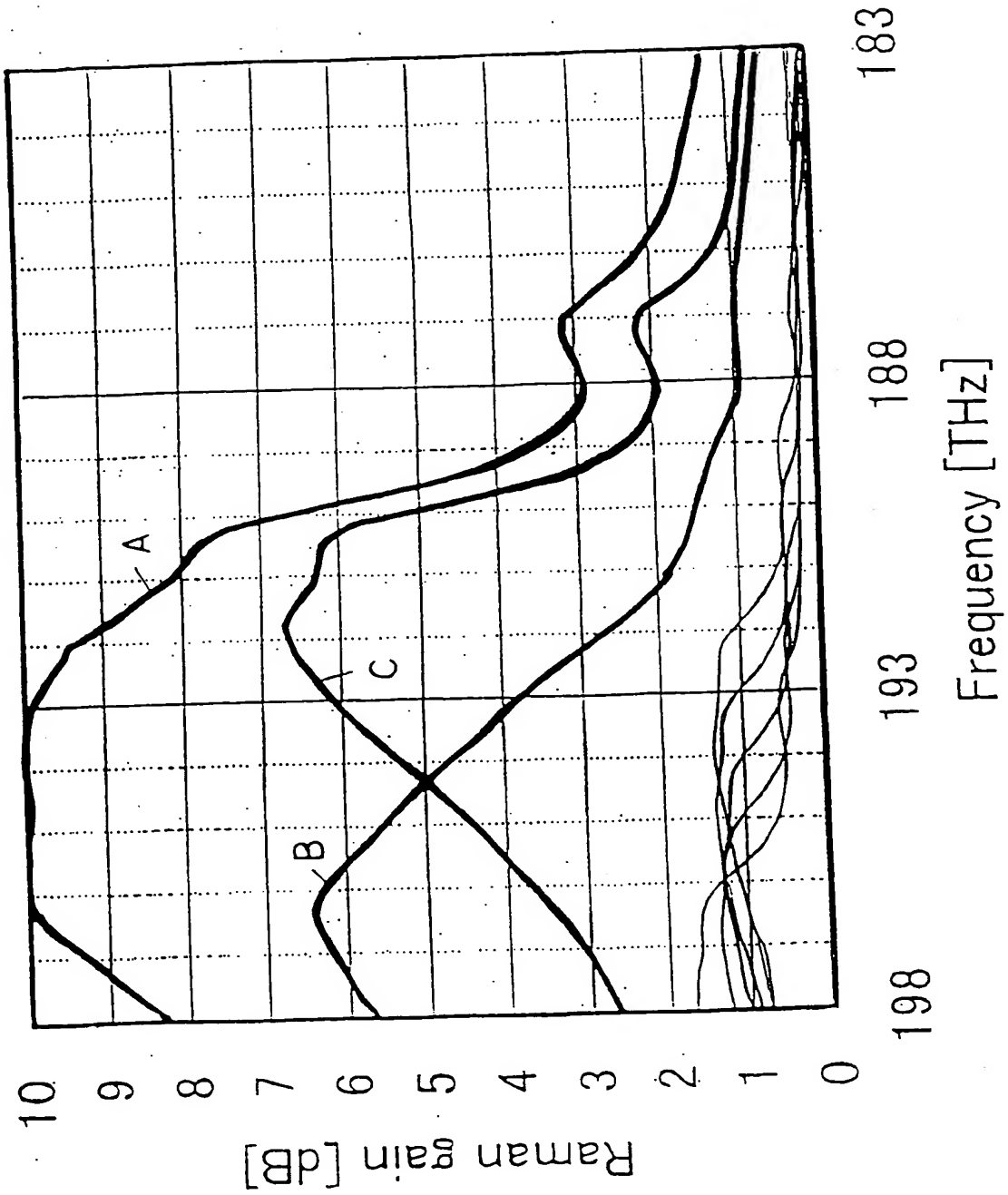


FIG. 61

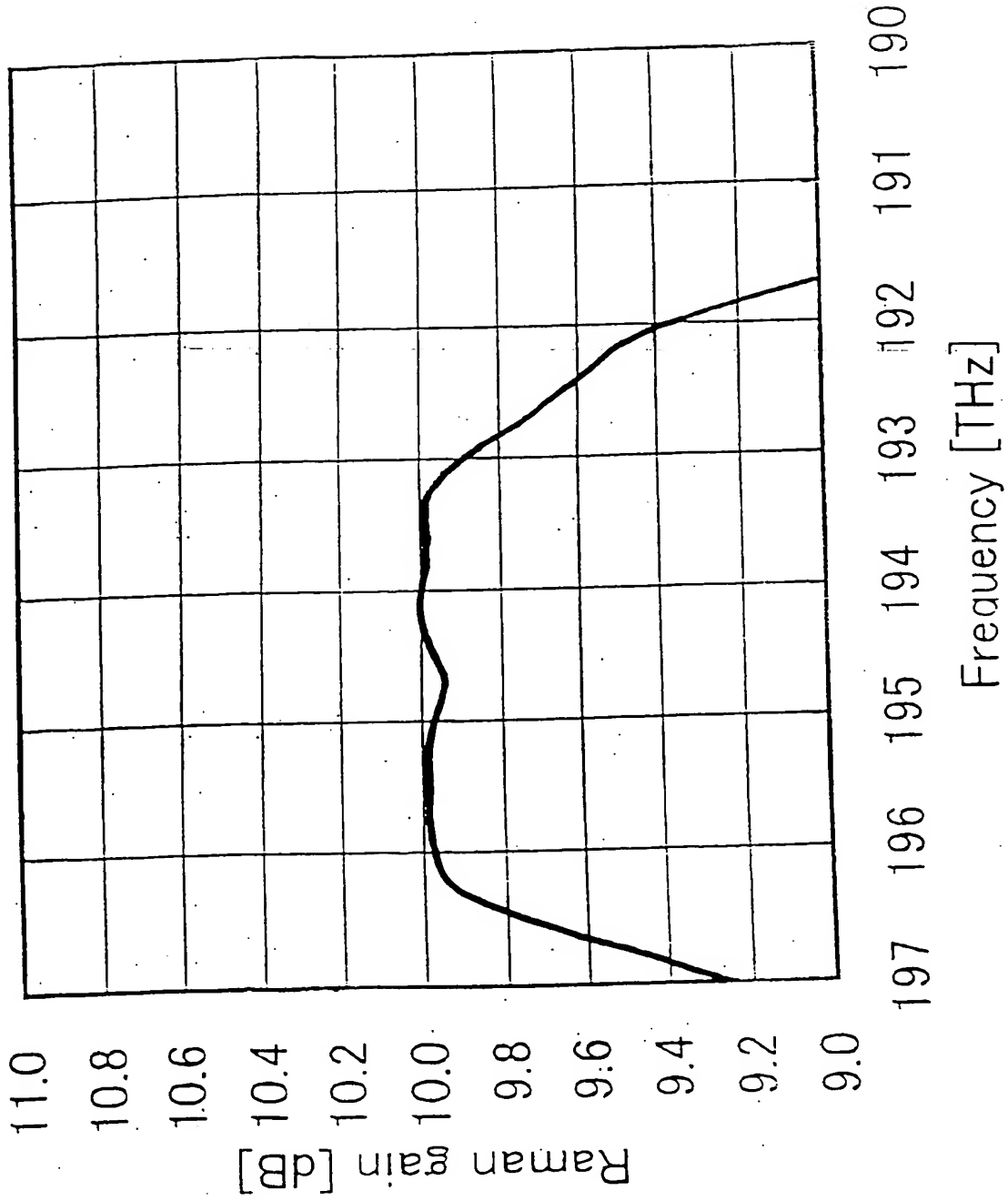


FIG. 62

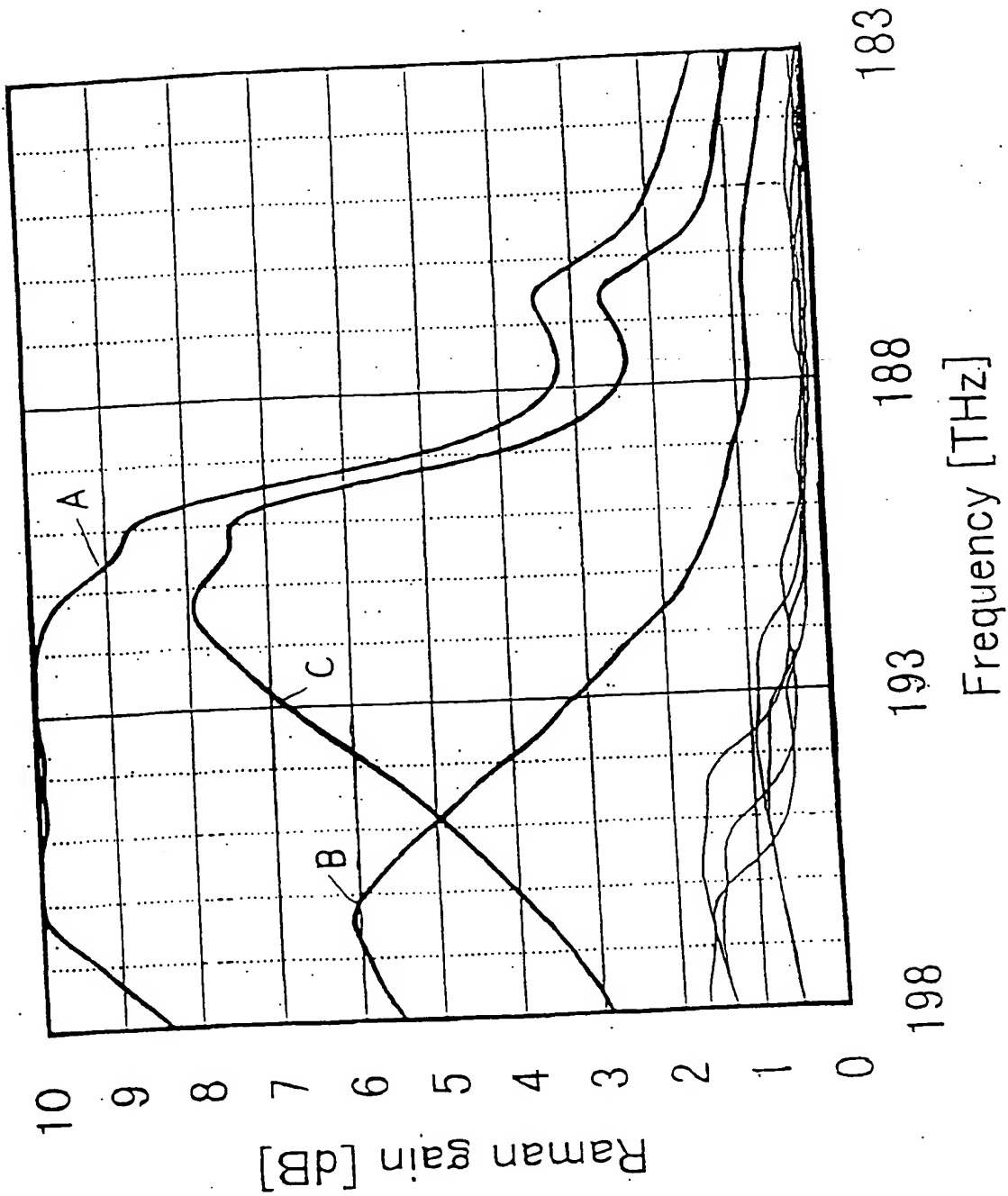


FIG. 63

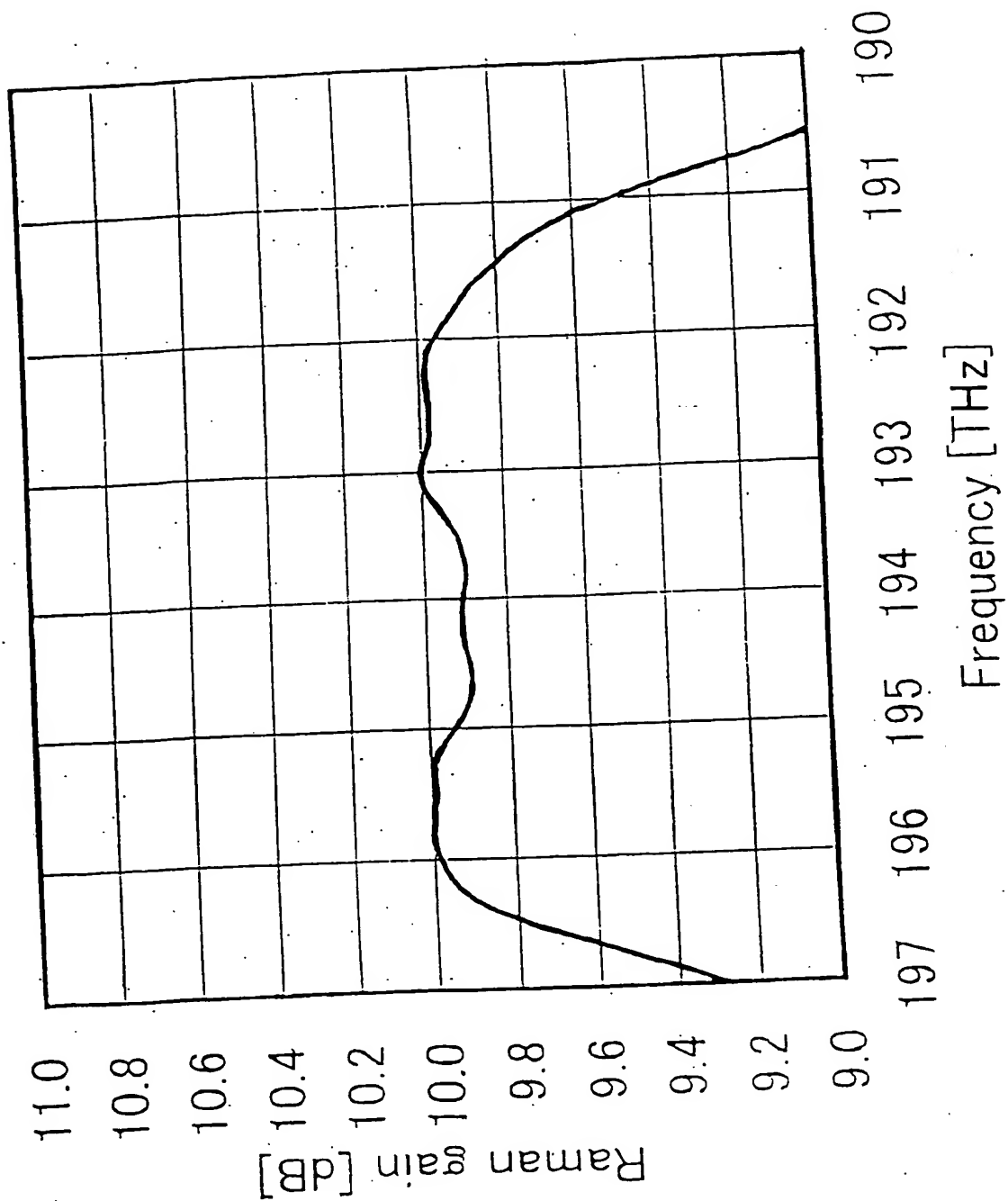


FIG. 64



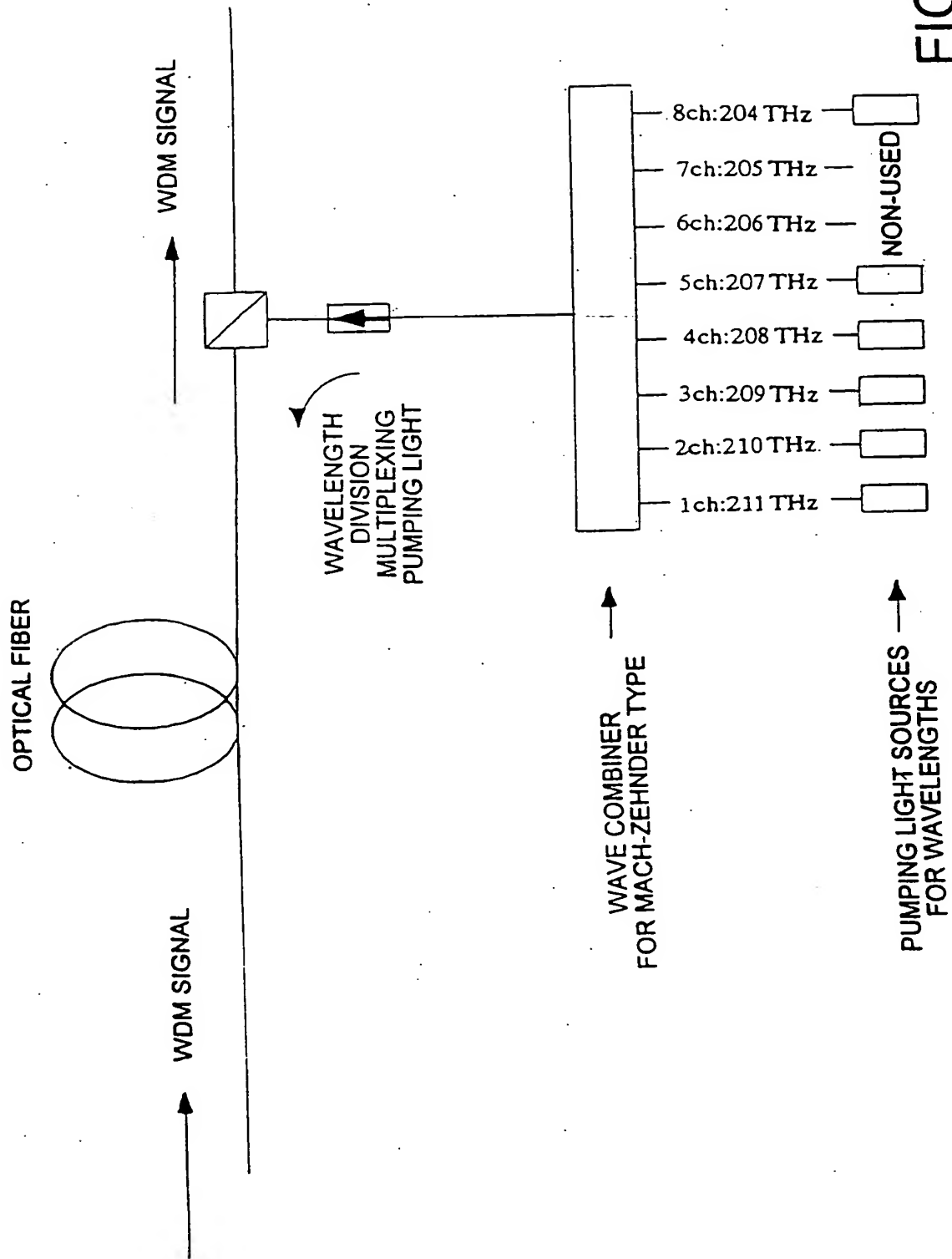


FIG. 65

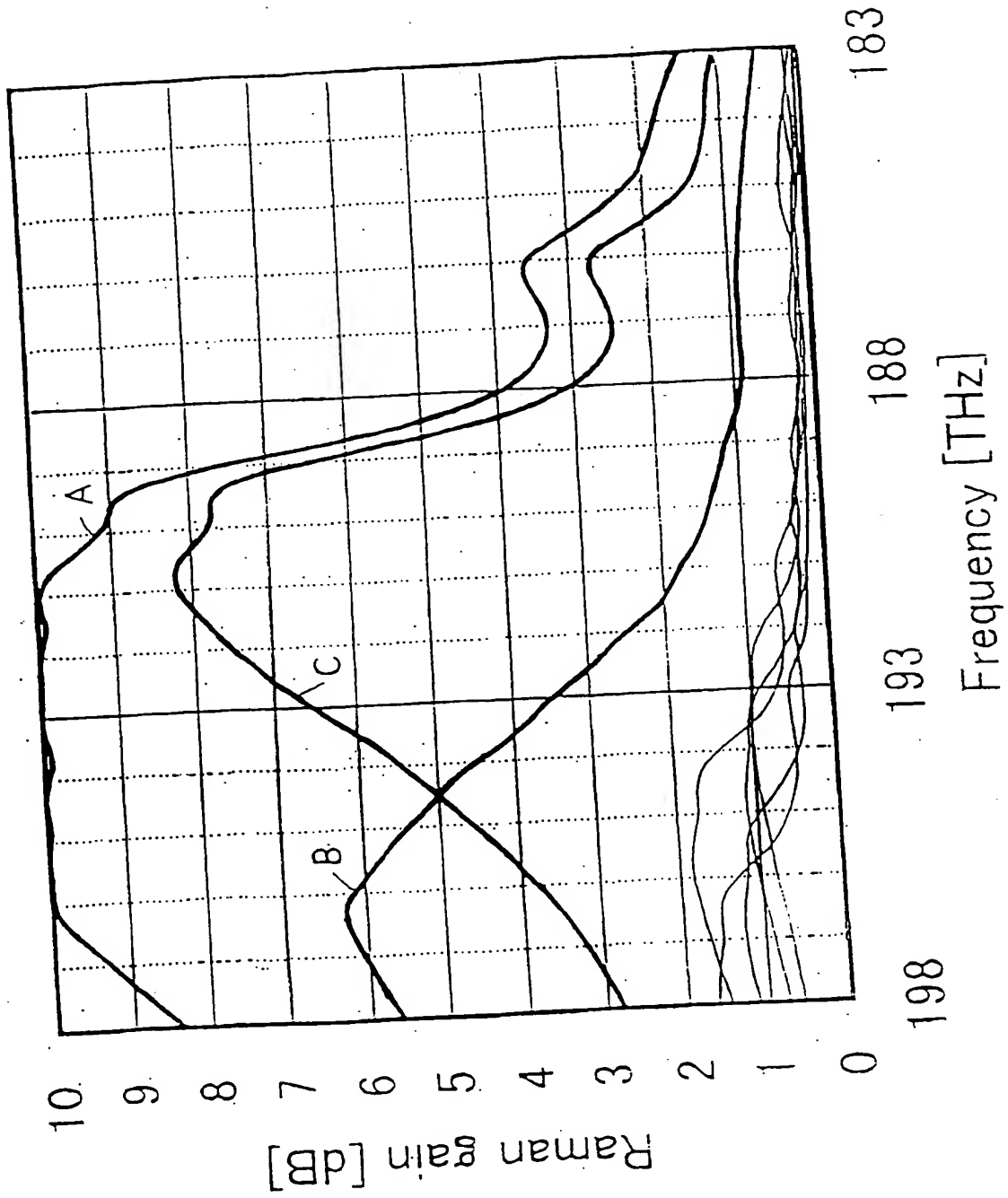


FIG. 66

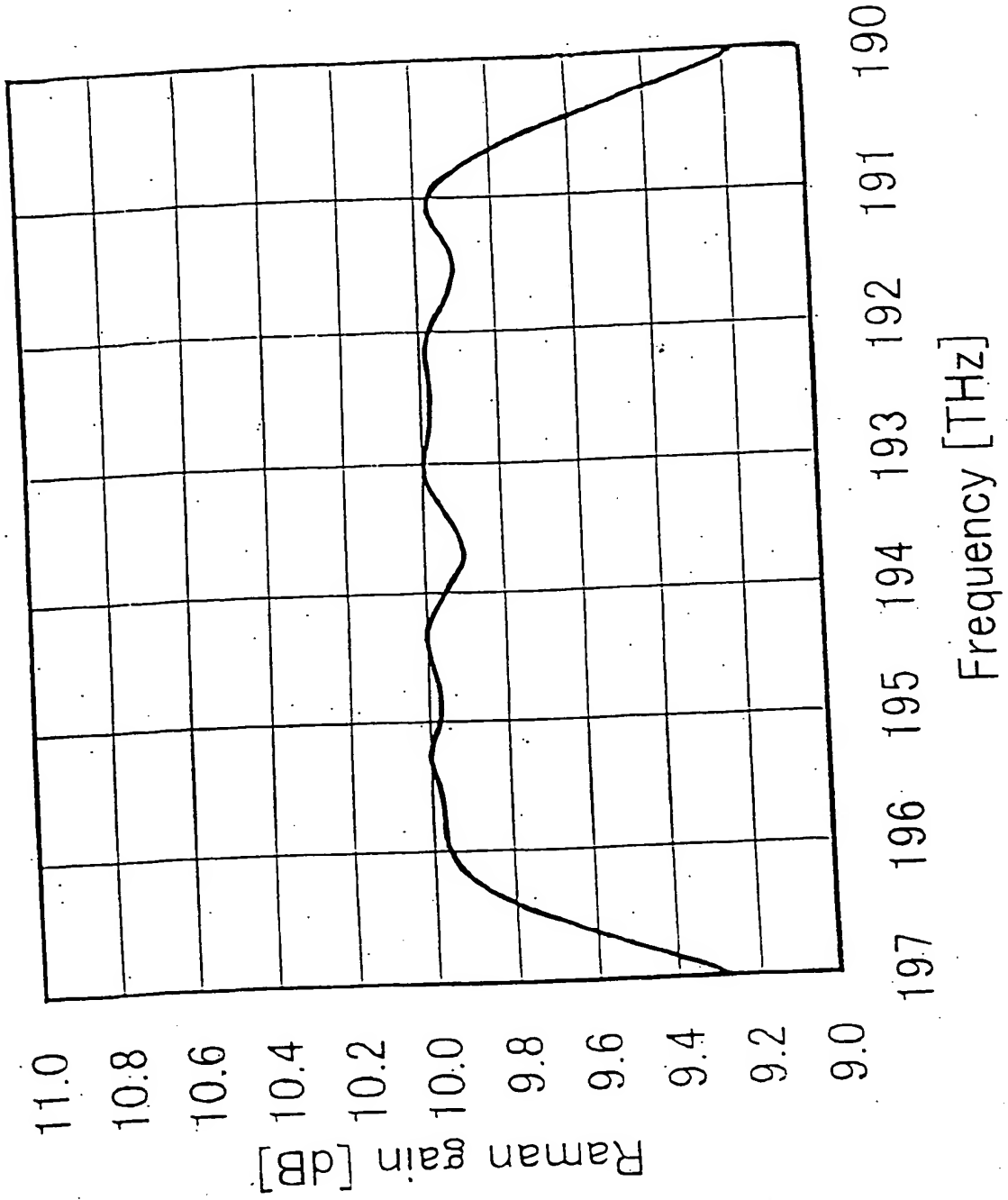
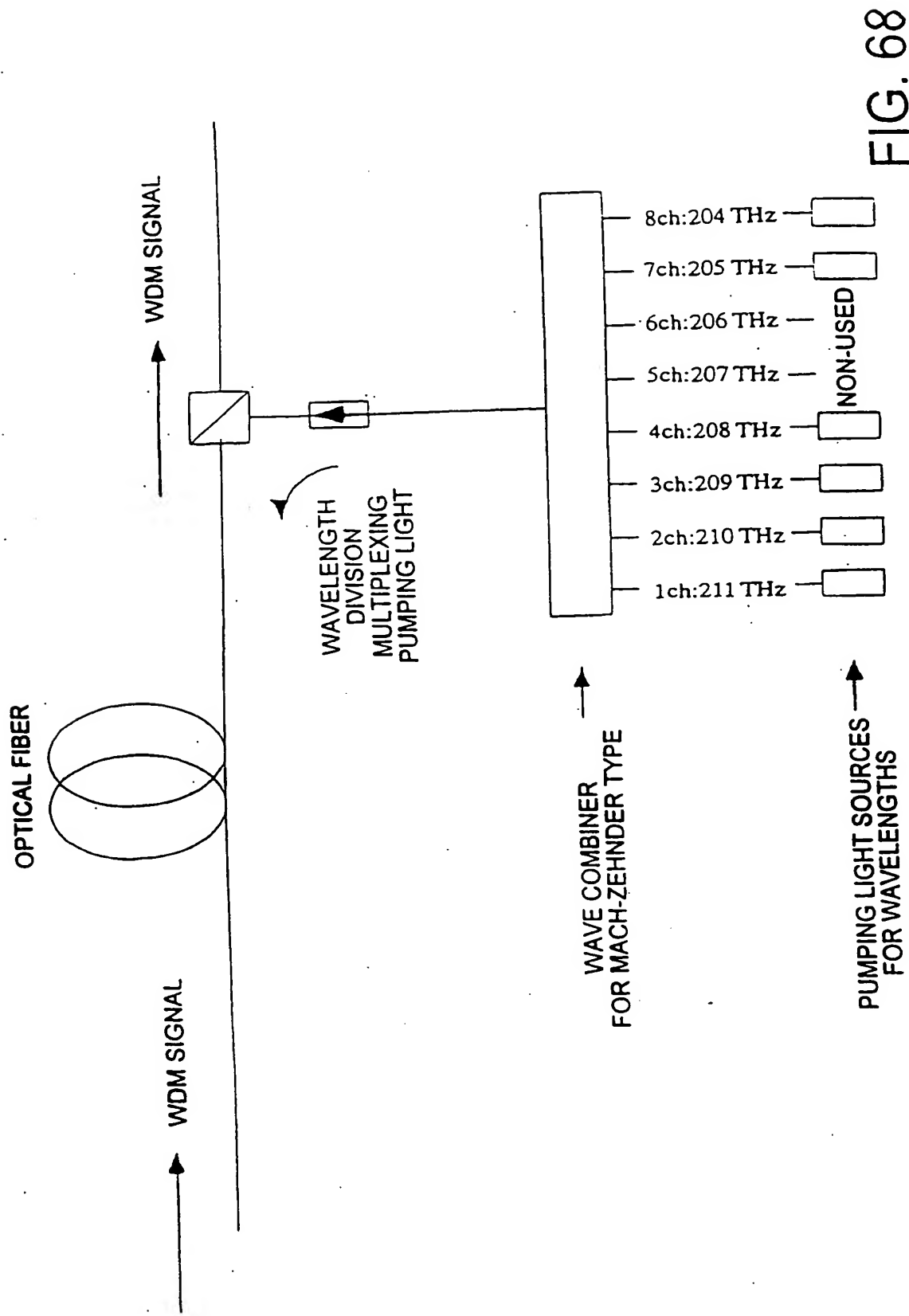


FIG. 67



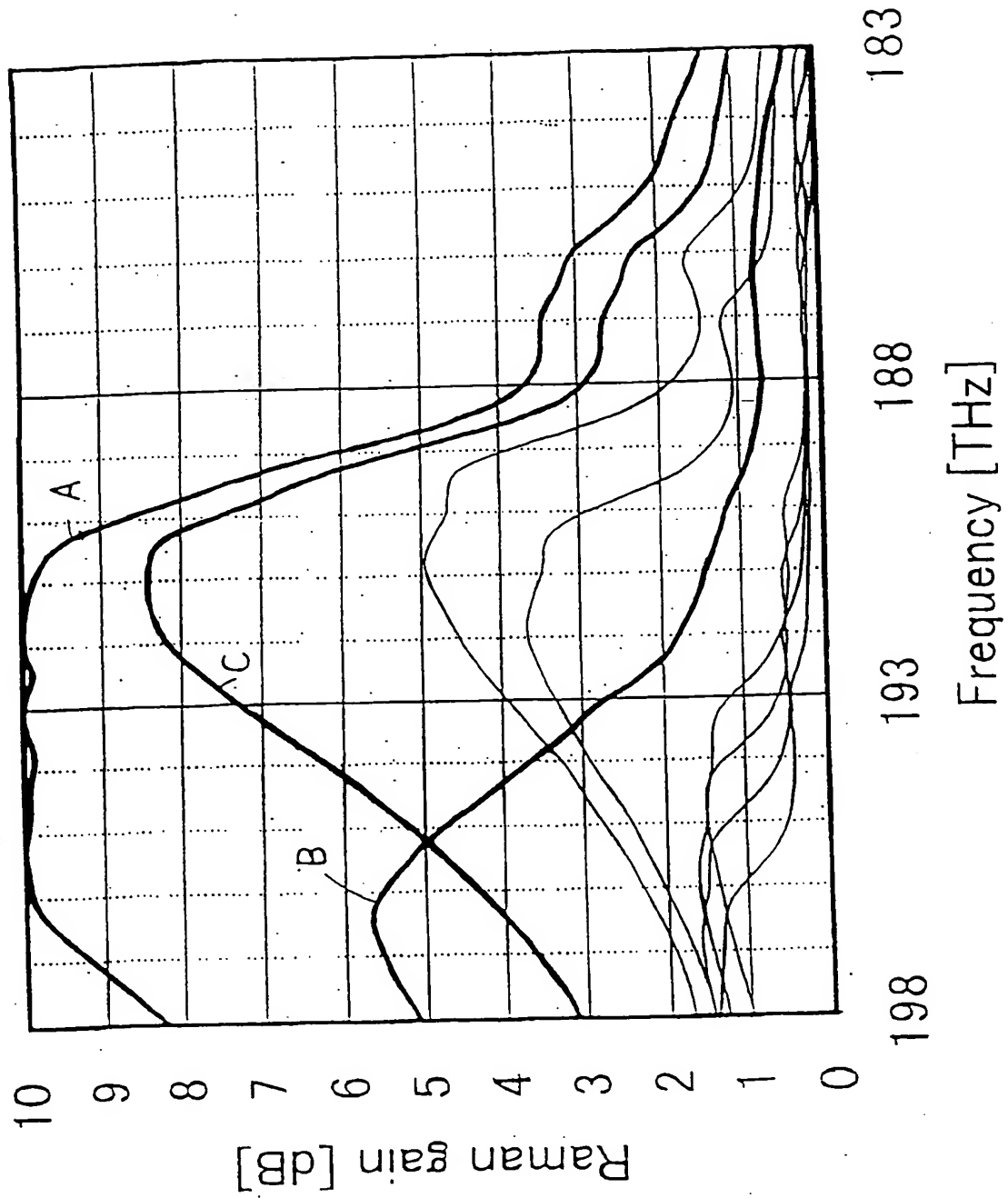


FIG. 69

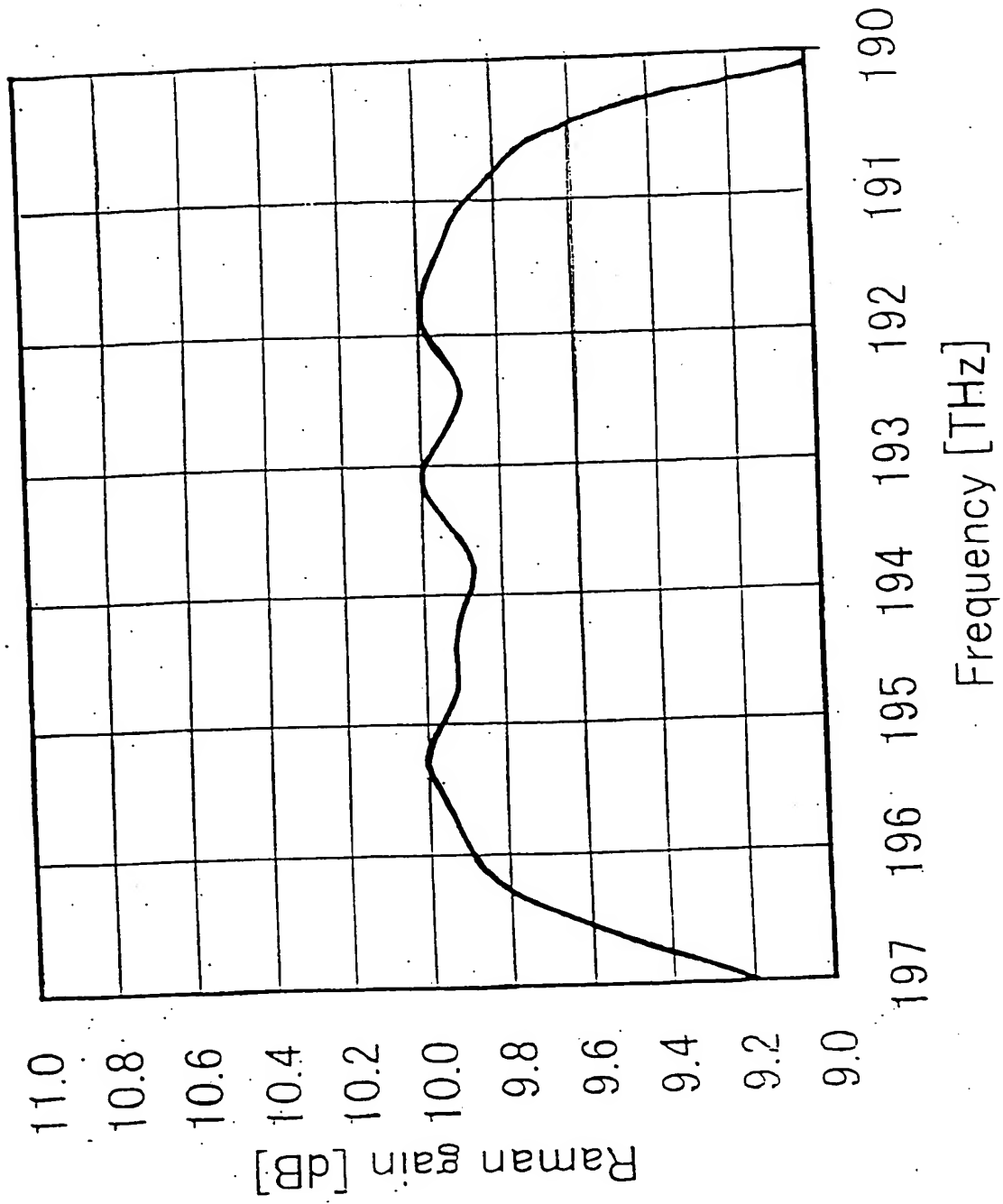


FIG. 70

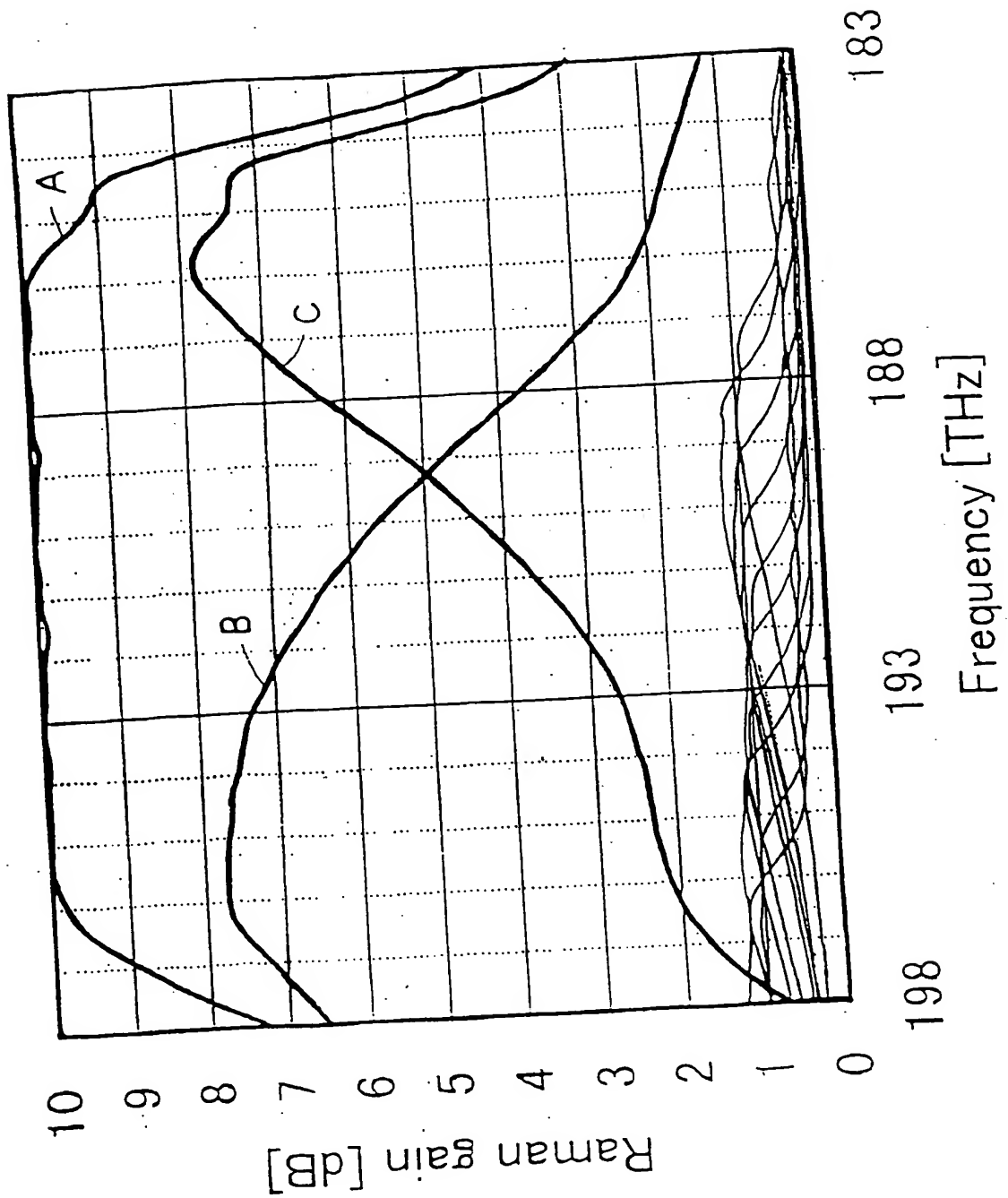


FIG. 71

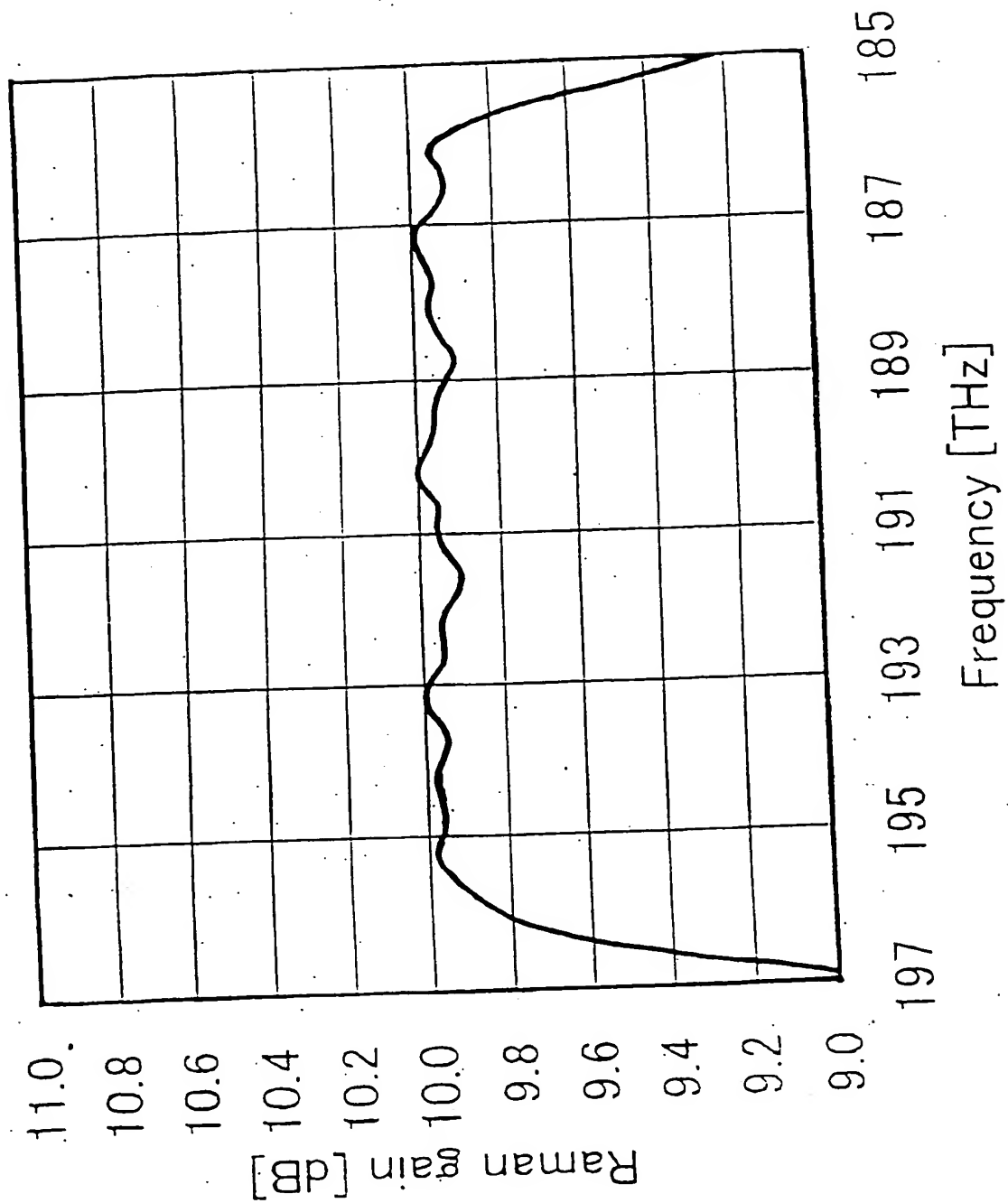


FIG. 72



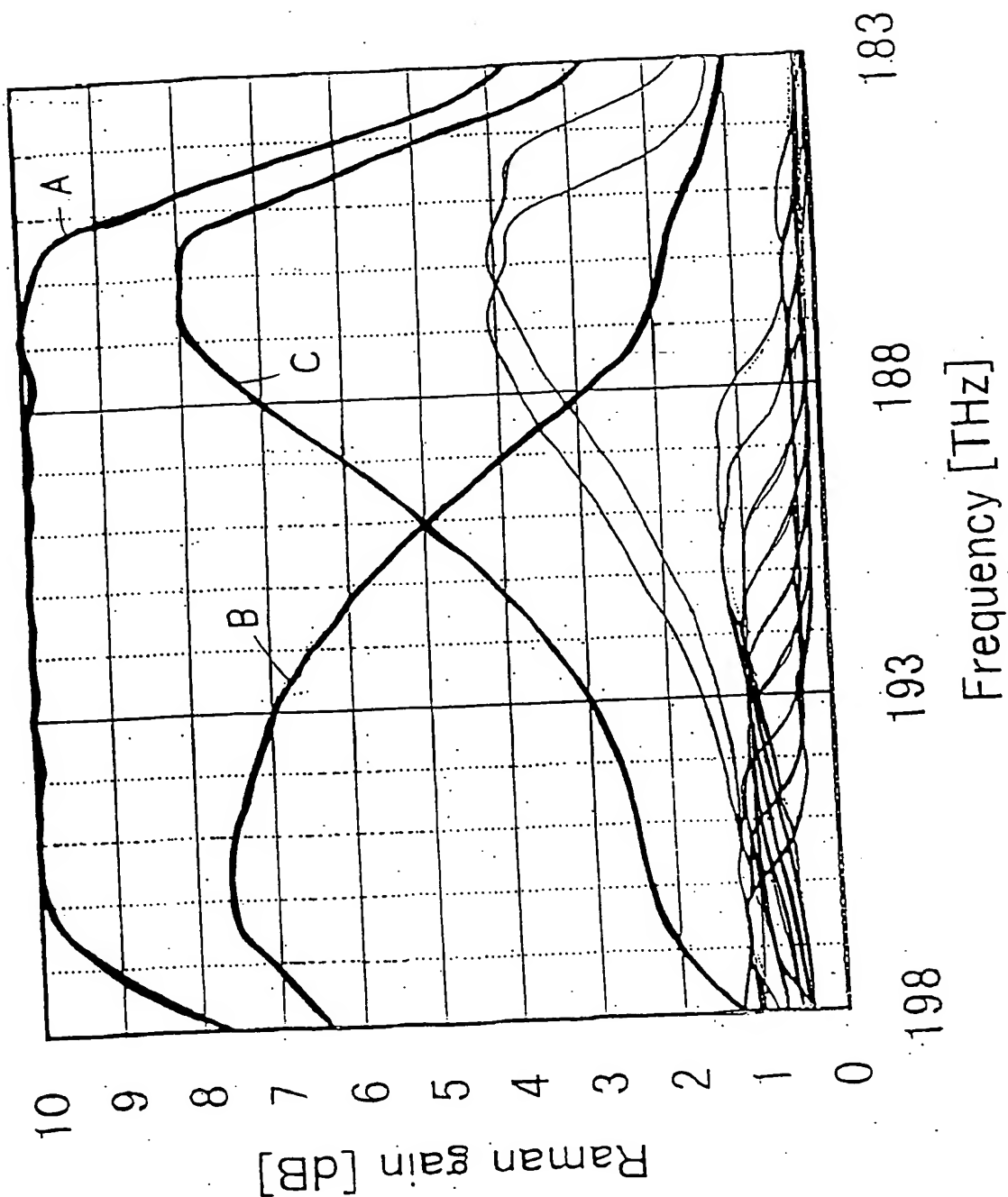


FIG. 73

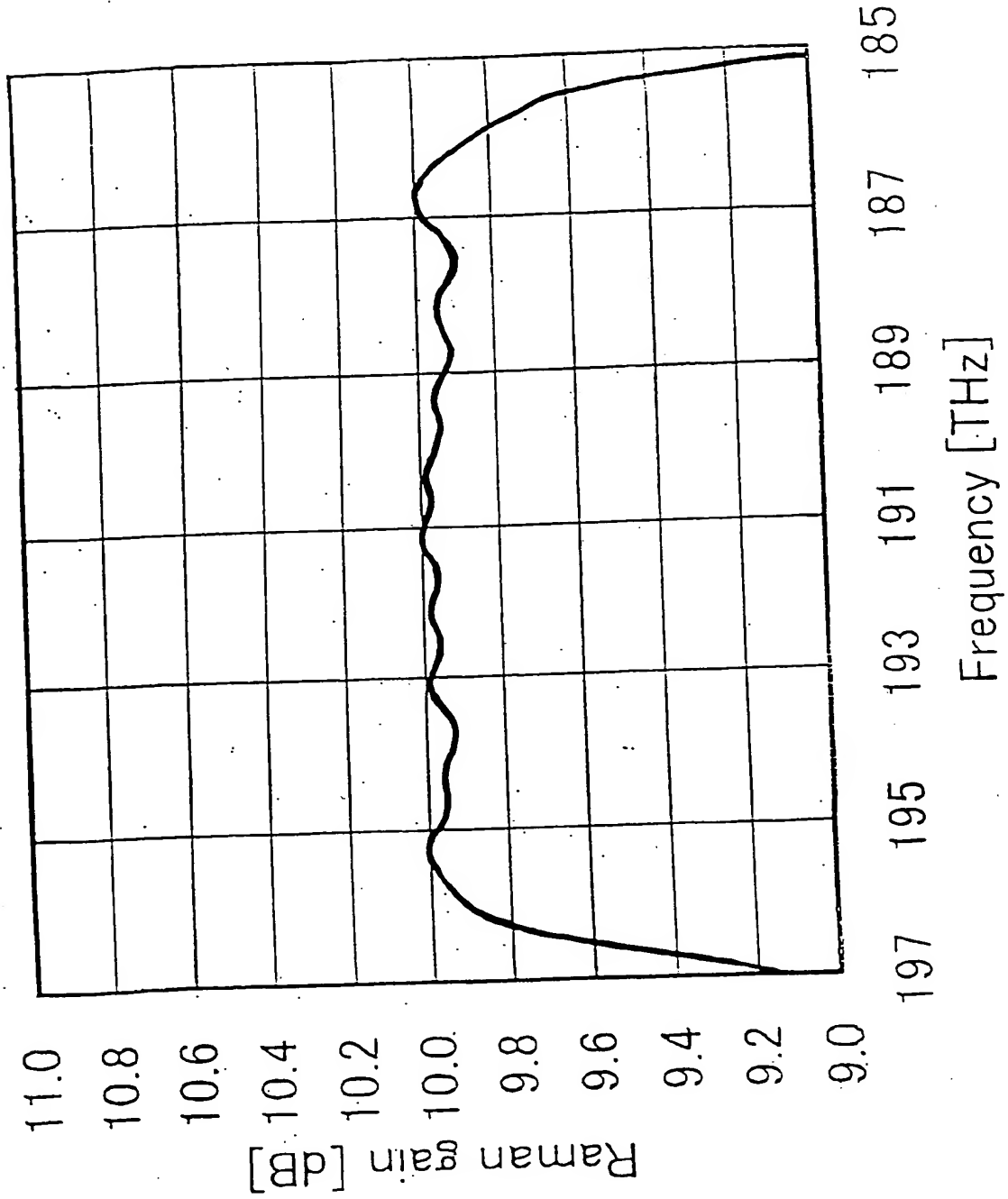


FIG. 74